CLEAN RIVERS PROGRAM
BASIN SUMMARY REPORT

LOWER NECHES BASIN and
NECHES-TRINITY COASTAL BASIN

APRIL 2004

DRAFT BASIN SUMMARY REPORT

LOWER NECHES BASIN AND NECHES-TRINITY COASTAL BASIN

July 15, 2004

Prepared by:
Lower Neches Valley Authority
In cooperation with the Texas Commission on Environmental Quality
Under the Authorization of the Clean River Act

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES, continued

Page

LIST OF TABLES

EXECUTIVE SUMMARY

In 1991, the Texas Legislature passed the Texas Clean Rivers Act in response to growing concerns that water resource issues where not being addressed in a holistic manner. This legislation requires water quality assessments be conducted for each river basin in Texas. The Texas Clean Rivers Program was created under this act.

The goal of the Clean Rivers Program (CRP) is to maintain and improve the quality of water within each river basin in Texas through an ongoing partnership involving the Texas Commission on Environmental Quality (TCEQ), river authorities, other agencies, regional entities, local governments, industry and citizens. The program uses a watershed management approach to identify and evaluate water quality issues, establish priorities for corrective action and work to implement those actions.

Assessment Area

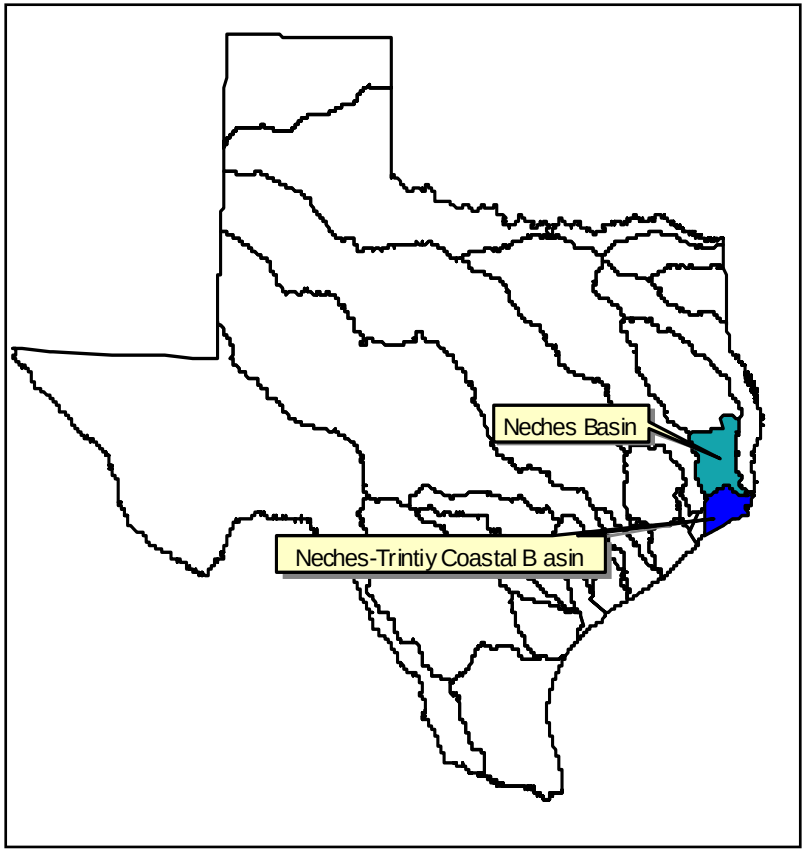
The Neches River Basin has an overall length of 210 miles and a maximum width of 70 miles. It is located in eastern Texas, geographically oriented between the Sabine River to the east and the Trinity River to the west. The Neches-Trinity Coastal Basin is situated in the southeastern most portion of Texas.

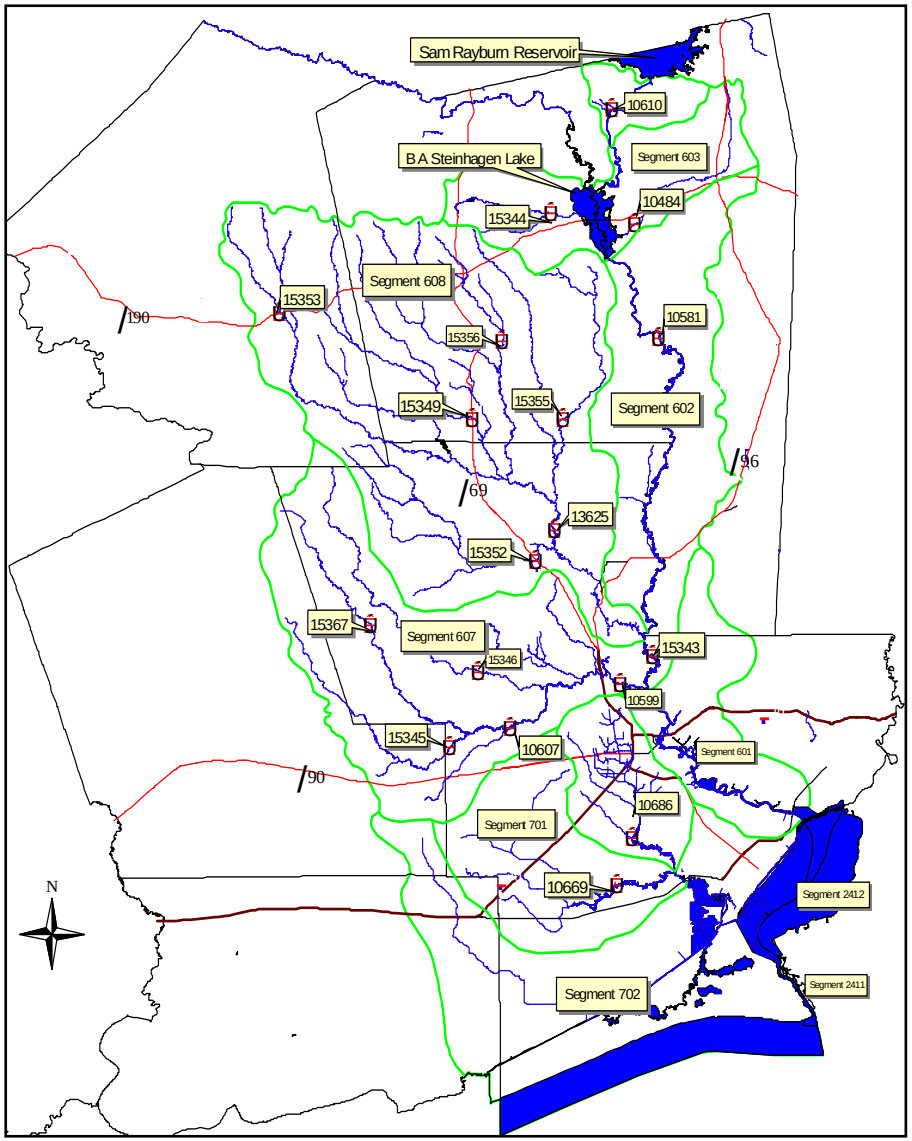
The Lower Neches Valley Authority (LNVA) is responsible for monitoring and assessing the surface waters of the lower Neches River Basin and Neches-Trinity Coastal Basin, an area approximately 3,318 square miles, see Figure ES-1. The assessment area extends from the Angelina River below Sam Rayburn Reservoir southward to the Texas Gulf Coast. The upper Neches River Basin is monitored and assessed by the Angelina and Neches River Authority (ANRA). The following lists of classified water body segments defined in the Texas Surface Water Quality Standards are assessed by LNVA for the Clean Rivers Program.

<u>Lower Neches Basin</u>
Segment 0601 – Neches River Tidal
Segment 0602 – Neches River below B. A. Steinhagen Lake
Segment 0603 – B. A. Steinhagen Lake
Segment 0607 – Pine Island Bayou
Segment 0608 – Village Creek
Segment 0609 – Angelina River below Sam Rayburn Reservoir

<u>Neches-Trinity Coastal Basin</u>
Segment 0701 – Taylor Bayou above Tidal
Segment 0702 – Intracoastal Waterway Tidal
Segment 0703 – Sabine/Neches Canal Tidal
Segment 0704 – Hillebrandt Bayou
Segment 2411 – Sabine Pass
Segment 2412 – Sabine Lake

Figure ES-1
Lower Neches and Neches-Trinity Coastal Basin
Assessment Area





Activities and Accomplishments

Long-term CRP objectives in the basin have been to efficiently administer allocated funds, eliminate duplicative monitoring efforts, set water quality priorities, provide a forum for citizens to express their ideas on water quality issues, and maintain a public outreach program.

LNVA consistently meets the fiscal objective by maintaining administrative costs less than 10% of allocated funds. By keeping administrative costs low, LNVA collected over 14,000 water quality data points for the statewide database in the last 5 years.

Annually, LNVA organizes a coordinated monitoring meeting for the entire Neches River Basin and the Neches-Trinity Coastal Basin. Coordination among different monitoring entities is essential to the success of the CRP program by eliminating duplicative monitoring effort and focusing on water bodies where additional data are needed. In the spirit of cooperation and coordination, LNVA funds water quality monitoring on Sam Rayburn Reservoir in cooperation with ANRA. The data are provided to CRP as in-kind service by LNVA.

Historically, LNVA has worked with a steering committee, a diverse group of stakeholders, representing a variety of interests in water quality. Steering committee meetings are held at least annually to discuss the progress of the current CRP contract period as well as consult on water quality problems and set monitoring priorities. The steering committee provides a forum for citizens to contribute ideas on water quality issues in the basin.

Assessment Methodology

The TCEQ administers water quality management programs with the goal of protecting, maintaining, and restoring Texas water resources. *Texas Surface Water Quality Standards* (TSWQS) recognize the regional and geologic diversity of the state by classifying surface waters into defined segments. Appropriate water uses, such as aquatic life, contact recreation, and general water use, are designated for each classified segments. TCEQ has established screening levels for nutrients and chlorophyll, providing a quantitative basis for evaluating water quality concerns.

Support of the aquatic life use is based on assessment of dissolved oxygen criteria, toxic substances in water (metals and organics) criteria, ambient water and sediment toxicity test results, and biological screening levels for habitat, macrobenthos, and fish. Each criteria set is evaluated independently of the others, and use support level identified when any of the individual criteria are not attained.

Contact recreation is designated to all water bodies, except when ship and barge traffic makes contact recreation unsafe. Full support of the contact recreational use is not a guarantee that the water is completely safe of disease-causing organisms. Samples collected for fecal coliform are used in this report to determine support of contact recreational use.

Water quality criteria for several constituents are established in the TSWQS to safeguard general water quality, rather than for protection of a specific use. Water temperature, pH, chloride, sulfate, total dissolved solids (TDS) are the parameters evaluated to determine the general quality of a water body. Criteria for each parameter are assigned to the classified segments based on physical, chemical, and biological characteristics.

Nutrient and chlorophyll stream standard criteria have not been adopted for Texas water bodies by the TCEQ. Screening levels listed for nutrients and chlorophyll are statistically derived from long-term monitoring data.

Significant Findings

Overall water quality in the lower Neches Basin and Neches-Trinity Coastal Basin is good. Many of the 38 sites within the 12 classified segments fully support their designated uses with no water quality concerns; however, this cannot be said for all sites. For detailed discussion of watershed assessments, please refer to Watershed Summaries section of this report

Findings in the lower Neches Basin

Low dissolved oxygen and low pH values in tributaries to the Neches River still persist. Other impairments include elevated bacteria, high ammonia-nitrogen and increased dissolved metals in lower Neches Basin were identified in this report.

Non-support or partial support of aquatic life use assessed due to low dissolved oxygen (DO) levels throughout Pine Island Bayou and tributaries to Village Creek remain. The occurrence of depressed DO in both watersheds is probably due to natural causes such as high ambient summer temperatures, low stream velocities, and decaying forest material.

Low pH values are also recurring on the mainstem of Village Creek, resulting in a partial support of its general use criterion. The pH levels in Village Creek watershed are normally low, ranging of 4.8 to 7.2, and are considered a natural environmental condition.

Elevated bacteria levels were identified as non-support of contact recreational use for Sandy Creek in Segment 0603, Turkey Creek and Big Sandy Creek in Segment 0608. The factors contributing to or correlated with elevated bacteria, such as streamflow, are inconclusive.

A water quality concern due to high ammonia-nitrogen concentrations was identified at 1 site in the Pine Island Bayou watershed. Data analysis is not indicative of a source for the nutrient concern.

The most conspicuous finding is the high number of non- support results of dissolved metals for both chronic and acute screening levels. In Segment 0607 – Pine Island Bayou, acute screening levels were exceeded by aluminum and zinc while chronic screening levels were

surpassed by cadmium and lead samples. Similarly, chronic levels of lead and cadmium were exceeded in Segment 0608 – Village Creek as well as acute levels of aluminum. These water bodies are normally turbid due to runoff from clay and silt prevalent soils. Aluminum is a natural component of soils, and a correlation of turbidity with aluminum was identified. This relationship, however, does not explain the presence of zinc, cadmium and lead detected.

The average concentration of the pesticide Malathion exceeded its criteria established for the protection of aquatic life use at two sites in Segment 0601 – Neches River Tidal. A full assessment of the aquatic life use support cannot be made at this time due to an insufficient number of samples for this parameter.

Findings in the Neches-Trinity Coastal Basin

Water quality issues identified within the Neches-Trinity Coastal Basin include low dissolved oxygen, high levels of dissolved aluminum, and elevated ammonia-nitrogen and chlorophyll *a* concentrations.

Partial support of the dissolved oxygen (DO) criterion occurred in Taylor and Hillebrandt Bayous while a non-support was identified in Shallow Prong Lake on Big Hill Bayou. Intensive 24 hour dissolved oxygen data were collected for Hillebrandt Bayou and Taylor Bayou and reported in 2001. The low oxygen is not indicative to an oxygen consuming pollutant, but rather to fluctuations due to algal blooms in the waterbody. Low levels of DO in Taylor Bayou are not uncommon. Compared to the previous assessment, current partial support of DO is an improvement from the non-support reported in 2001.

Water quality concerns where documented for ammonia-nitrogen in Hillebrandt Bayou and the Intracoastal Waterway segments. Additional water quality concerns where recognized in Taylor Bayou, Hillebrandt Bayou, and the Intracoastal Waterway for high concentrations of chlorophyll *a*. A temporal plot of chlorophyll indicates a positive trend or an increase with time. No correlation was found between nutrients (ammonia-nitrogen and total phosphorous) and chlorophyll *a*.

Another waterbody in the Neches-Trinity Coastal Basin with a history of impairment is Alligator Bayou. Alligator Bayou is a freshwater tributary of Taylor Bayou, with a watershed of approximately 40 square miles, upstream from the saltwater barrier. Discharges to the waterbody are primarily from municipal and industrial facilities, with a smaller amount from agricultural runoff. The waterbody was identified as partially supporting the aquatic life use, due to ambient toxicity in water and sediment, and listed on the state's 303(d) List in 2000. Due to the high level of toxicity in water and the complex mixture of the compounds, identification of the cause is not possible with current technologies. Considerable amounts of lethal and sub-lethal toxicity were found in sediments. The toxicity in sediment is attributable to a combination of metals and organic compounds. Additional testing using more advanced techniques will be necessary to determine specific toxins.

Not all screening results revealed impairments. The contact recreational use and general use criteria, where applicable, are fully supported for all water bodies in the Neches-Trinity Coastal Basin.

Recommendations

To address data screening results and assessments, LNVA developed and annually reviews, a Basin Action Summary. The summary is a resource for water quality management planning. The Basin Action Summary can be found in Appendix A.

Water quality impairments are prioritized (high, medium and low) in the Basin Action Summary, according to the nature of the impairment, data needs, action(s) taken, and recommended action(s). For the next biennium, LNVA will work closely with the TCEQ to focus on the following priority impairments:

- → Resolve low dissolved oxygen impairment on Pine Island Bayou by assisting TCEQ with a Use Attainability Analysis to determine appropriateness of the standard.
- → In Spring 2004, hold first meeting with stakeholder workgroup to address elevated ammonia-nitrogen concentrations in Hillebrandt Bayou.
- → Increase metals in water sampling and analysis to ascertain source(s) of lead, cadmium, and zinc in the Village Creek and Pine Island Bayou watersheds.
- → Recommend a Special Study by TCEQ Region 10 to evaluate the low dissolved oxygen levels in Taylor Bayou.
- → Continue organics sampling in Segment 0601 to assess the pesticide Malathion.

Basinwide recommendations include the following:

- → Sustain the routine monitoring program data collection efforts.
- → Evaluate nutrient data for the development of segment criteria.
- → Promote public outreach and educational efforts.

Sufficient funding is necessary to meet the Clean Rivers Program goal of maintaining and improving the quality of water within each river basin. All CRP planning agencies are being asked to increase monitoring efforts while meeting stringent quality assurance requirements on static budgets. In 2001, the 77th Legislature passed House Bill 2912 mandating TCEQ (then TNRCC) to consolidate the water quality assessment fee (referred to as the Clean Rivers Fee) and the waste treatment inspection fee. Consolidation of funds will mean the Clean Rivers Program will no longer be guaranteed the level of funding as it had previously. If surface waters are to be protected in Texas then the need for increased funding dialog which begins at the steering committees and stakeholders levels must be carried forward all the way through the legislature.

I. INTRODUCTION

This Basin Summary Report assesses water quality and summarizes the Clean Rivers Program (CRP) activities in the lower Neches basin and Neches-Trinity Coastal Basin. It is provided to the Texas Commission on Environmental Quality (TCEQ) and all interested parties in fulfillment of the requirements of the Clean Rivers Program.

The CRP was enacted in 1991 by the 72nd Legislature to ensure the comprehensive assessment of water quality in each watershed and river basin in the state of Texas. In response to this legislation, the TCEQ adopted permanent rules establishing the CRP. These rules allow for river authorities, under the supervision of TCEQ, to conduct regional assessments of the watersheds in their jurisdiction. This assessment process is made possible from the participation of public institutions, private industry, and individuals helping to determine how best to protect Texas' water resources.

The Lower Neches Valley Authority (LNVA) is the planning agency for CRP activities and serves as the data clearinghouse for the lower Neches River Basin and the Neches-Trinity Coastal Basin. The LNVA CRP staff is responsible for collecting and analyzing water quality data to identify and prioritize water quality impairments. Data are analyzed using methods developed by TCEQ in the *Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data*.

Program Goals and Objectives

The goal of the Clean Rivers Program (CRP) is to maintain and improve the quality of water within each river basin in Texas through an ongoing partnership involving the Texas Commission on Environmental Quality (TCEQ), river authorities, other agencies, regional entities, local governments, industry and citizens. The program uses a watershed management approach to identify and evaluate water quality issues, establish priorities for corrective action and work to implement those actions.

Data Collection and Analyses

Water quality monitoring is an effort to obtain information on the physical, chemical, and biological characteristics of water. LNVA and TCEQ Region 10 are responsible for the monitoring activities within the lower Neches and Neches-Trinity Coastal Basins. Since 1997, LNVA has increased its monitoring efforts and implemented a comprehensive monitoring approach. This approach involves fixed station routine monitoring, systematic sub-watershed monitoring, and targeted monitoring. All monitoring is conducted according to TCEQ's *Surface Water Quality Monitoring Procedures Manual*.

The fixed station routine monitoring program provides a long-term baseline database for trend analysis. This baseline data is used to assess water quality and identify concerns within each segment of the basins. These assessments will help determine where future systematic monitoring efforts will be directed. LNVA and TCEQ Region 10 routinely monitor 38 sites each within the two basins on a quarterly basis. During sampling events, field measurements such as dissolved oxygen, pH, specific conductance, temperature, stream flow, and secchi depth are measured and recorded at each site. Samples are also collected for laboratory analysis. Metals in water samples are collected to assess acute (short term) and chronic (long term) exposure to aquatic life. More information about routine monitoring and parameters can be found in the Technical Summary section of this report.

The purpose of systematic monitoring is to further investigate specific concerns within the assessment area. Systematic monitoring focuses on smaller watersheds to collect additional data that will augment routine monitoring data to verify water quality concerns or identify where additional resources are needed. Currently, LNVA is conducting systematic monitoring for dissolved oxygen in Segment 0607 – Pine Island Bayou. Results from this study will be discussed in the Watershed Summaries section of this report.

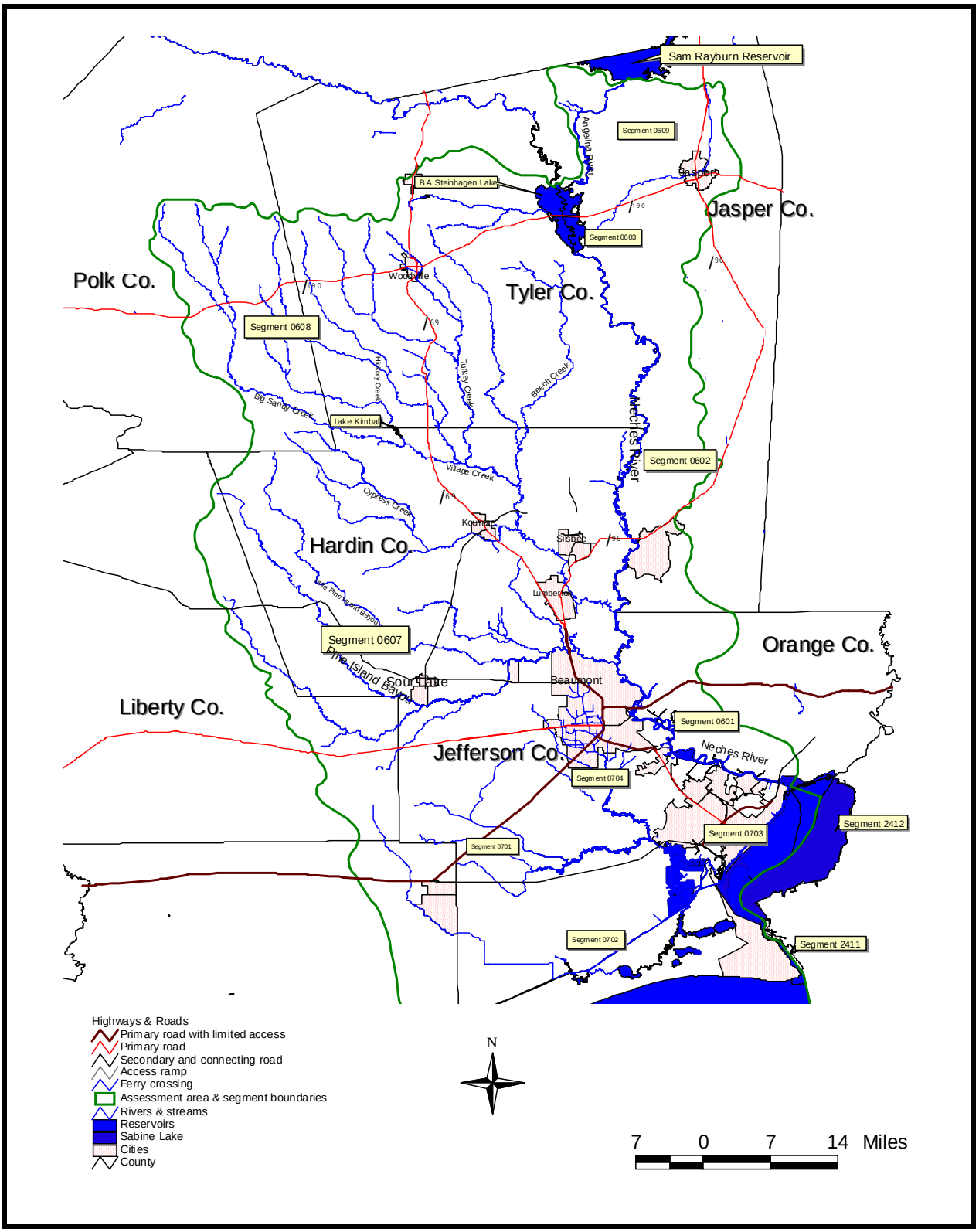
In targeted monitoring, site-specific data are collected for CRP fee payers. This data provides TCEQ with information needed for permit renewals or the setting of new permit load limits. Beginning March 2004, LNVA will monitor four sites under the targeted monitoring tier to assist our fee payers with their permits

Coordinated Monitoring

In order to ensure the most cost effective monitoring of the Neches Basin and Neches-Trinity Coastal Basin, the CRP program relies on a cooperative effort between agencies within the basin. LNVA coordinates monitoring activities in the lower portion of the Neches Basin with the United States Geological Survey (USGS), Surface Water Quality Monitoring staff from Austin, TMDL staff and TCEQ Region 10 office. LNVA host an annual coordinated monitoring meeting with Angelina Neches River Authority and TCEQ staff. Additionally, LNVA funds the Sam Rayburn Reservoir On-Site Systems Management and Watershed Protection Program conducted by the Angelina Neches River Authority (ANRA). The data collected is provided to TCEQ by LNVA through ANRA as an in-kind service.

Figure 600.1 is a map on page 3 of LNVA's CRP assessment area in the Lower Neches Basin and Neches Trinity Coastal Basin.

Figure 600.1-LNVA Assessment Area



Lower Neches Basin Physical Characteristics

The lower Neches River Basin encompasses approximately 3318 square miles in the eastern portion of Texas. It consists of all of Hardin County, as well as portions of Tyler, Jasper, Jefferson, Liberty, Polk, and Orange Counties. Urbanized areas include Port Neches, Jasper, Silsbee, Kountze, Lumberton, Sour Lake, and the northern section of Beaumont. Non-urban regions include pastures, marshes, croplands, and the East Texas region commonly known as the "Piney Woods". Several Big Thicket National Preserve Units are also located in this portion of the Basin.

Major tributaries to the lower Neches River include Village Creek (Segment 0608) and Pine Island Bayou (Segment 0607). The tributaries monitored by LNVA's in Segment 0608 include Big Sandy Creek, Turkey Creek, Hickory Creek, Beech Creek, and Cypress Creek. In Segment 0607, LNVA monitor's three locations on Pine Island Bayou as well a site on Little Pine Island Bayou near Sour Lake and on Willow Creek near Nome.

Lower Neches Basin Water Quality Characteristics

As would be expected, the quality of surface water tends to reflect the characteristics of the watershed. The lower Neches Basin is generally flat and heavily forested with pine, oak, and sweet gum. The streams in the basin meander through forested areas and acidic soils. These soils consist of sand, silt, and large deposits of colloidal clay. Many area streams are low gradient and course through low-lying "swampy" areas where depressed levels of dissolved oxygen and low pH develop naturally. Periods of low stream flow and warm weather further contribute to low dissolved oxygen levels.

While nature accounts for some of the areas water quality shortcomings, other water quality problems cannot be attributed to the environment. Impairments to surface water are generally attributed to point and non-point source pollution. While point sources are regulated, such as discharge from a municipal or industrial wastewater treatment plant, non-point sources are largely unregulated. Non-point source pollution occurs when rainfall runoff transports contaminants over the land surface into adjacent water bodies. Not only can pollutants on land be washed into waterways, airborne contamination can precipitate out or be deposit directly in the water bodies or on land, and then washed into the water bodies.

According to the TCEQ's non-point source pollution management program, 94% of all impairments or threats of impairments to water bodies of the state are due wholly or in part to non-point source pollution.

Neches-Trinity Coastal Basin Physical Characteristics

The Neches-Trinity Coastal Basin is situated in the southeastern most portion of Texas within the Gulf Coastal Plain eco-region. Low gradient streams, dredged waterways, and an estuary characterize the water bodies in the basin. The Neches-Trinity Coastal Basin consisting of six segments, and are jointly monitored by LNVA and TCEQ Region 10.

- ⇒ Segment 0701 - Taylor Bayou above tidal
- ⇒ Segment 0702 - Intracoastal Waterway
- ⇒ Segment 0703 - Sabine-Neches Canal
- ⇒ Segment 0704 - Hillebrandt Bayou
- ⇒ Segment 2411 - Sabine Pass
- ⇒ Segment 2412 - Sabine Lake

Taylor and Hillebrandt Bayous are the primary inland drainage ways. The headwaters of Taylor and Hillebrandt Bayous originate in the northern and western parts of Jefferson County and southeast Liberty County. From here, the bayous meander south and southeasterly, before emptying into the Intracoastal Waterway, Sabine Lake and Sabine Pass.

Neches-Trinity Coastal Basin Water Quality Characteristics

The water quality in the Neches-Trinity Coastal Basin generally supported its uses throughout the basin; however, several segments shown low levels of dissolved oxygen, high nutrient concentrations and elevated concentrations of aluminum.

Area water bodies with low DO have sluggish flow and/or low atmospheric aeration capabilities, which can be further aggravated by point and non-point source inputs. These conditions contribute to depressed dissolved oxygen concentrations.

Water quality concerns due to high chlorophyll concentrations at three (3) sites and high ammonia-nitrogen concentrations at three (3) sites were identified in this report. The screening levels for chlorophyll in the Neches-Trinity Coastal Basin are low (11.5 micrograms per liter or parts per billion) when compared to inland reservoirs (22.5 micrograms per liter). The high ammonia-nitrogen concentrations are currently, and historically, a concern in Hillebrandt Bayou. LNVA has organized a stakeholder workgroup to address this issue in FY 2004-2005.

Alligator Bayou in 0702 has shown toxicity levels in sediment and water and an impaired fish community. A Total Maximum Daily Load, which is a study to determine the total amount of a pollutant a water body can assimilate and still meet state water quality standards has been conducted on Alligator Bayou. The goal of this TMDL study was to provide the foundation for establishing an implementation plan to restore and maintain beneficial uses of Alligator Bayou. More in depth discussion of recent findings in this basin can be found in the Watershed Summaries section of this report.

This page left blank intentionally

II. PUBLIC PARTICPATION AND OUTREACH

The Lower Neches Valley Authority's Clean Rivers Program (CRP) public participation and outreach program includes a number of activities and events that ensure the public understands the role they play in protecting water resources. These activities target audiences of all ages. Public involvement is essential to ensuring that the Clean Rivers Program meets its goals for water quality.

CRP Steering Committee

Steering members in pre-meeting discussion

A major component of the Clean Rivers Outreach Program at LNVA is the CRP Steering Committee. LNVA's CRP Steering committee consists of 28 members representing local industry and municipalities, TCEQ, Texas Parks and Wildlife, Texas Forest Service, South East Texas Regional Planning Commission, environmental groups, and the general public. A diverse basin wide committee ensures that the different interests, concerns, and priorities of each watershed are represented. The main objectives of the committee are to assist with creation of realistic water quality objectives and basin priorities, the review and development of work plans and allocation of resources, and the establishment of monitoring priorities. Members are encouraged to voice any local or regional concerns they may have as well as to consider the interests of the basin as a whole.

The CRP Steering Committee meets publicly at least once a year and has covered a wide range of topics. Some of these topics have included the following:

- Status of LNVA's Neches River Saltwater Barrier
- Updates on monitoring activities being conducted throughout the lower Neches Basin and Neches-Trinity Coastal Basin
- An overview of the new "ultra-clean" metals sampling technique
- A solicitation for advice on forming a project board for a TMDL project on Sam Rayburn Reservoir
- The creation of a special project on Hillebrandt Bayou to address elevated ammonia
- An update on the Alligator Bayou TMDL

A list of current Steering Committee Members can be found in Appendix B. For more information on LNVA's CRP Steering Committee, how to become involved, or when the meetings are scheduled, visit LNVA's website at http://lnva.dst.tx.us or contact Andrew Bruno by email at andrewb@lnva.dst.tx.ux or by phone at (409) 898-0561.

LNVA Web Site (http://lnva.dst.tx.us)

LNVA is the CRP data clearinghouse for the lower Neches Basin and Neches Trinity Coastal Basin and maintains a web page for easy public access. This web site not only includes information about LNVA and its ongoing projects, but it also is a source of information for the Clean Rivers Program as well.

As the data clearinghouse for the Clean Rivers assessment area, water quality data are available on the web site. When the LNVA page is accessed, users can link to the Clean Rivers Program Data and to a list of monitoring stations can be selected. By selecting a particular station ID number, the user can access data that has been collected for that particular site. Web site data are updated twice per year.

In addition to water quality monitoring data, the Clean Rivers section of the website also includes:

- The Quality Assurance Project Plan
- Coordinated Monitoring Schedule
- Past Basin Highlights Reports and Summary Reports
- Meeting Announcements
- Special Studies
- Links to outside resources

For more information please visit the web site or call (409) 898- 0561.

Outreach Events and Programs

LNVA participates in the annual Environmental Round Robin held at Martin Dies Jr. State Park. This spring- time event provides area elementary school students an opportunity to learn about the importance of the Clean Rivers Program and water quality. Participants are introduced to the physical, chemical, and biological characteristics of water and the means to observe and measure these characteristics. At the end of LNVA's demonstration, each student is presented with a certificate stating they are an "Honorary Water Quality Analysts." Each year over 100 students participate in this event. Other agencies involved in this event include the Texas Parks and Wildlife game wardens and the Martin Dies Jr. State Park Rangers, representatives from the Texas Forest Service and Texas Department of Public Safety.

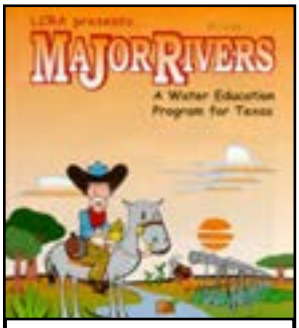
Large mouth bass at Fisheries Center

LNVA also participates in the Texas Parks and Wildlife's Texas Rivers Exhibit held at its Freshwater Fisheries Center in Athens during the month of February. An exhibit on LNVA CRP activities is displayed with pamphlets and educational information available for all ages. An estimated 600 students were expected to visit the facility during this event with an additional 1406 people visiting the facility throughout February. Last year was the Fisheries first year to host the event and LNVA will continue to participate in this event in the future.

Another successful program for a number of years has been LNVA's student internship program. This program provides college students with valuable field and laboratory experience in many aspects of environmental work not otherwise covered by their degree. This hands on experience is a valuable tool for learning outside of the controlled environment of a classroom and in fact has led several participants to careers in the field of water quality. LNVA will to continue this program as funding allows.

The Clean Rivers Program and LNVA were the proud sponsors of book covers for the 2003-2004 school year for all Beaumont Independent School District elementary schools. The front cover was designed by an area high school student and reflects the theme, "*Why is it important to keep the river clean?*" The back cover was filled with educational word games and puzzles on the subject of water quality. LNVA CRP staff received letters from students from many of the schools in appreciation of the book covers. This school year was the first time book covers were sponsored, and as funds are available, LNVA will continue to make these covers available in the future. The book covers are an excellent way to provide students, teachers, and parents with information about water quality, the Clean Rivers Program and LNVA.

A popular educational tool for 4th grade students in the assessment area has been the Major Rivers Program. In addition to the introductory video, student workbooks, and teacher's guide, students also receive information to share with their families filled with tips on efficient home water usage and water conservation. Their school packs cover topics such as defining a watershed, the Texas water supply, water use, water treatment and water conservation. This is a valuable tool serving not only to educate students about water but also reaching their families as well. LNVA will continue providing Major Rivers to area students and has already ordered packets for the 2004- 2005 school year.



Front cover of workbooks

By continuing to keep the public involved in Clean Rivers, LNVA is ensuring that its program will be successful and achieve its water quality goals. To learn more about LNVA's programs and upcoming events, please visit www.lnva.dst.tx.us or call at (409) 898-0561.

This page left blank intentionally

III. TECHNICAL SUMMARY

Overview

The technical summary provides a detailed discussion of each classified segment in the assessment area. Data collected from January 1997 through August 2003 were screened and analyzed for this report were. Background information, monitoring stations map, assessment results, and recommendations for future monitoring are presented in the *Watershed Summaries* section of this report. Graphical trends and correlations of specific parameters are also included in the *Watershed Summaries* to communicate water quality conditions discussed in the text. Preceding the watershed summaries is a technical process section to explain TCEQ methods of assessing water quality and identifying concerns. Tables 600.1-3 are provided to explain the support levels or water quality concerns based on the percentage of data not meeting the screening levels. Numeric values of screening levels for each parameter can be found in the watershed summaries. The screening levels are criteria, which the water quality parameters are compared. For example, the dissolved oxygen (DO) screening level is the stream standard for a particular segment. The DO screening level, or stream standard may be 5 mg/L, which means that a monitoring site fully supports the DO level when individual measurements are 5 mg/L or more. Conversely, nutrient screening levels are not based on stream standards because nutrient stream standards have not been adopted by TCEQ. A monitoring site is not a concern for nutrients when concentrations are less than or equal to the nutrient screening level. Field and conventional parameters are collected during routine monitoring to provide data for assessing water quality. Each parameter is described below.

Chloride

Chloride is found in all watersheds to some degree. Concentrations can vary naturally, usually increasing as the mineral content increases. However, chlorides can be introduced by sewage effluent and discharge from oil field activity. Chloride is being collected during routine monitoring and analyzed for assessing the general use criteria. Small amounts of chlorides are required for normal cell functions in plant and animal life, however, high levels of chlorides can corrode metals and affect the taste of food products. Therefore, water that is used in industry or processed for any use has a recommended maximum chloride level.

Dissolved Oxygen (DO)

DO is necessary to support a healthy biological community, and is measured to determine support of the aquatic life use. Oxygen content is usually a good overall indicator of water quality in a stream. The stream standard for DO vary across the state, but in general high aquatic life use standard is 5 milligrams per liter.

Bacteria

The presence of high levels of bacteria indicates contamination from the waste of warm-blooded animals. This contamination could come from improperly treated wastewater, faulty septic systems or wildlife. Regardless of the source, elevated bacteria levels can indicate a possible health risk to those coming into contact with the water. Fecal coliform bacteria levels are used to determine the contact recreational use support. Since direct comparison of routinely collected bacteria to the stream standard cannot be made, a criterion of 400 colonies per 100 mL is used for assessment purposes. Beginning September 2001, LNVA began collecting *E. coli* bacteria samples in addition to fecal coliform bacteria as part of routine monitoring due to revisions to the *Texas Surface Water Quality Standards*. *E. coli* will eventually replace fecal coliform as the parameter to assess contact recreational use. By 2004 enough *E. coli* data will have been collected to make a full assessment using the new parameter.

Nutrients

The nutrients routinely monitored are compounds of nitrogen and phosphorous.

Nitrogen present in the form of ammonia-nitrogen and nitrite+nitrate-nitrogen can identify that pollutants are being introduced to a stream. While ammonia-nitrogen indicates a recent pollution event, nitrite+nitrate-nitrogen represents a change in oxidation state of the nitrogen over time, which could mean a pollution event occurred some time ago. Nitrogen compounds can be lethal to the aquatic community in high concentrations.

Phosphorus is an element in fertilizer that can enter streams through run off. Phosphorus in elemental form is very toxic and is subject to bioaccumulation. Phosphates ($PO4^{-2}$) are formed from this element. Phosphate will stimulate the growth of plankton and aquatic plants which provide food for fish. This increased growth may cause an increase in the fish population and improve the overall water quality. However, if an excess of phosphate enters the waterway, algae and aquatic plants will grow wildly, choke up the waterway and consume large amounts of oxygen.

Although stream standard for nutrients has not been established, results for these parameters are compared to nutrient screening levels that were derived from long term monitoring data.

pH

The term pH is used universally to express the intensity of the acid or alkaline condition of a solution. The pH scale is represented as a range from 0 to 14, with 7 being neutral. Streams located in southeast Texas are typically characterized by low pH (mildly acidic) due to tannic acids produced from the decay of rotting forest material. This parameter was collected during routine monitoring for determining the support of the general use. The stream standard for pH is expressed as a range, typically 6.0 to 8.5 pH units. Levels outside of the stream standard range can adversely affect the aquatic life, and cause significance problems when considering water and wastewater treatment activities.

Total Dissolved Solids (TDS)

Solids in water are made up of both suspended and dissolved solids. Solids that are dissolved in the water column consist mainly of carbonates, bicarbonates, chloride, and sulfates. Changes in TDS concentrations can be harmful because the density of the water determines the flow of water into and out of an organism's cells; however, if TDS concentrations are too high or too low, the growth of many aquatic organisms can be limited, and death may occur. Total dissolved solids are calculated from conductivity measurements and assessed for the general use criteria. TDS levels in the lower Neches Basin are generally less than 200 mg/L, whereas, in the Neches-Trinity Coastal Basin concentrations can range from 300 to 1,000 mg/L. The stream standard for TDS varies from segment to segment.

Sulfate

Sulfate can be dissolved in any natural waters. Concentrations of this ion usually vary greatly from one watershed to another due to the natural availability in rocks and soils. Sulfate is collected during routine monitoring and data results compared to general use criteria. Excessive amounts of sulfate can cause taste and odor problems in water treatment, and scaling in boilers & heat exchangers used for industrial purposes. Typical sulfate levels range from 15 - 20 mg/L in the lower Neches Basin to 30 - 55 mg/L in the Neches-Trinity Coastal Basin. The sulfate stream standard may vary from segment to segment.

Metals

High levels of metals and other toxic substances can be a health threat to both humans and aquatic life. Metals can affect drinking water and can accumulate in fish tissue to levels not suitable for human consumption. Dangerous levels of metals can be identified through chemical analysis of water, fish tissue, and sediment. Metals are analyzed to determine support of the aquatic life use. Results are compared to both an acute (long term) and chronic (short term) criteria. Some toxic substance concentrations are related to pH and hardness values; therefore, criteria for these metals are computed by including the 15th percentile of hardness data collected during routine monitoring in an equation.

Technical Process

The TCEQ administers water quality management programs with the goal of protecting, maintaining, and restoring Texas water resources. *Texas Surface Water Quality Standards* (TSWQS) recognize the regional and geologic diversity of the state by dividing major river basins, bays, and estuaries into defined segments. Appropriate water uses, such as aquatic life, contact recreation, and general water use, are designated for each classified segments. TCEQ has established screening levels for nutrients and chlorophyll, providing a quantitative basis for evaluating water quality concerns.

Support of the aquatic life use is based on assessment of the dissolved oxygen criteria, toxic substances in water (metals and organics) criteria, ambient water and sediment toxicity test results, and biological screening levels for habitat, macrobenthos, and fish. Each criteria set is evaluated independently of the others, and the use support level identified when any of the individual criteria are not attained. Support of aquatic life use can be classified as full, partial, or not supporting depending on the percent of data not meeting the criteria. See Table 600.1 for use support levels and their associated percent of data exceedances.

Contact recreation is designated to all water bodies, except when ship and barge traffic makes contact recreation unsafe. Full support of the contact recreational use is not a guarantee that the water is completely safe of disease-causing organisms. Samples collected for fecal coliform are used in this report to determine support of the contact recreational use. Use support is determined based on the single grab concentration of 400 colonies per 100 milli-liters criterion. Water bodies either fully support or do not support the contact recreational use. See Table 600.1 for use support levels and their equivalent percent of data exceedances.

Nutrient and chlorophyll stream standard criteria have not been adopted for Texas water bodies by the TCEQ. Screening levels listed for nutrients and chlorophyll are statistically derived from long-term monitoring data. The 85th percentile values for each parameter in freshwater streams, tidal streams, reservoirs, and estuaries are listed in the Watershed Summaries section of this report. A concern is identified if the sample sets exceed their respective screening levels more than 25 % of the time. See Tables 600.2 for screening levels for concern and no concern designations and their corresponding percent exceedances limits.

Criteria for several constituents are established in the TSWQS to safeguard general water quality, rather than for protection of a specific use. Water temperature, pH, chloride, sulfate, and total dissolved solids (TDS) are parameters evaluated to determine support of general water quality criteria. Criteria for each parameter are assigned to the classified segment based on physical, chemical, and biological characteristics. The criteria, however, do not apply to unclassified water bodies. Support of general water quality criteria based on water temperature and pH can be classified as full, partial, or not supporting. Criteria established in the TSWQS for chloride, sulfate and TDS represent annual averages. The criteria for chloride, sulfate, and TDS are not supported if the average of their respective data sets are exceeded. See Table 600.3 for support levels of general use criteria.

Trend Analysis

Trend analysis was conducted on at least one site and one parameter per segment. Simple linear regression and correlation techniques along with best professional judgment were used to illustrate the prevailing water quality. If available, monitoring sites were also analyzed versus flow to produce a better knowledge of water quality conditions.

Detection Limits

A detection limit is the minimum level that may be detected by a laboratory during routine operating conditions. Ambient Water Reporting Limits (AWRL) is the reporting limits adopted by the Clean Rivers Program for all parametric data collected. In general, an AWRL is greater than the detection limit for a particular parameter. Many of the values collected for the CRP are less than the detection limit. For these nondetects, 50% of the AWRL is the value used for assessment purposes. Values computed from 50% of the AWRL that exceed screening criteria are not counted as an exceedance, although they are used to develop screening levels and for calculating summary statistics. An exception to the rule of nondetects is when evaluating chronic toxicant and human health criteria for water. The criteria for these constituents are expressed as mean values. In these cases, the smaller of the following measurements is used in calculation of the mean: the 50 percent value reported for nondetects or 50 percent of the chronic criterion/human health criterion.

Contact Recreation

Water bodies in each segment are assessed for the contact recreational use to determine if water conditions are safe for swimming and other activities involving contact with the water. For this report fecal coliform is the bacteria assessed, with a grab sample criteria of 400 colonies/ 100 mL. For intensively collecting fecal coliform, a criterion of 200 colonies/100 mL applies to the geometric mean of at least five samples collected during a 30-day period. Escherichia coli (E. coli) has recently been identified TCEQ as a better bacteria contamination indicator and was adopted as the bacterial indicator in the stream standards. E. coli will be assessed in future reports.

Aquatic Life Use

Classified segments are assigned criteria based on the aquatic community present. Levels of aquatic life are classified as Exceptional, High, Intermediate, or Limited; dissolved oxygen criteria for these levels are 6.0, 5.0, 4.0, and 3.0 mg/L, respectively. Tidally influenced streams criteria are generally 1 mg/L less than normal criteria for any given level. Dissolved oxygen is measured and compared to the set criteria to determine support of the aquatic life use. Unclassified streams are assessed using the nearest downstream classified segments criteria unless site-specific studies have determined otherwise.

General Use

Watersheds must also support their general use, which is determined by monitoring water temperature, pH range, chloride, sulfate, and total dissolved solids. Suitability for use as a public water supply is also assessed based on concentrations of the parameters listed above.

Table 600.1-Use Support Criteria

Use	Parameter/Criteria or Screening Levels	Fully Supporting	Partially Supporting	Not Supporting
Aquatic Life Use	Dissolved Oxygen	0-10% of data are less than criterion.	11-25% of data are less than criterion.	>25% of data are less than criterion.
Aquatic Life Use	Toxicants (metals and organics): Acute - short term exposure Chronic - long term exposure	0-10%, of data, for any individual parameter exceeds the acute criterion and/or the mean do not exceed the chronic criterion.	11-25%, of data, for any individual parameter exceeds the acute criterion and/or the mean do not exceed the chronic criterion.	>25%, of data, for any individual parameter exceeds the acute criterion and/or the mean do not exceed the chronic criterion.
Contact Recreation	Fecal Coliform 400 colonies/100 mL	0-25% of data exceeds screening level.	Partial support is not assessed.	>25% of data exceeds screening level.

Table 600.2-Nutrient Screening Levels

Category Stream	Parameter/Screening Levels		No Concern	Concern
Freshwater Streams	NH3-N	0.16 mg/L	For any one parameter, the screening level is exceeded 25% or less of the time	For any parameter, the screening level is exceeded greater than 25% of the time
	NO2-N +			
	NO3-N	3.50 mg/L		
	OP	0.90 mg/L		
	TP	1.10 mg/L		
	Chlorophyll *a*	13.7 µg/L		
Tidal Streams	NH3-N	0.44 mg/L		
	NO2-N +			
	NO3-N	2.34 mg/L		
	OP	0.90 mg/L		
	TP	1.11 mg/L		
	Chlorophyll *a*	23.0 µg/L		
Estuaries	NH3-N	0.12 mg/L		
	NO2-N +			
	NO3-N	3.26 mg/L		
	OP	0.18 mg/L		
	TP	0.23 mg/L		
	Chlorophyll *a*	14.6 µg/L		

Table 600.3-General Use Criteria

Parameter	Units/Criteria	Fully Supporting	Partially Supporting	Not Supporting
Water Temperature	ºC, segment specific	0-10% of data does meet criterion	11-25% of data does not meet criterion	>25% of data does not meet criterion
pH	Standard Units, segment specific	0-10% of data does not meet criteria	11-25% of data does not meet criteria	>25% of data does not meet criteria
Chloride	mg/L, segment specific	Segment average less than criterion	Partial support is not assessed	Segment average exceeds criterion
Sulfate	mg/L, segment specific	Segment average less than criterion	Partial support is not assessed	Segment average exceeds criterion
Total Dissolved Solids	mg/L, segment specific	Segment average less than criterion	Partial support is not assessed	Segment average exceeds criterion

WATERSHED SUMMARIES

This section is designed to facilitate communication of water quality by watershed; grouping monitoring sites and data in close geographic proximity, with similar watershed characteristics. The grouping is based on the Texas Surface Water Quality Standards (TSWQS) defined stream segments. All sites monitored in the watershed of a defined segment (both on segment and off) are included in the discussion of the segment; therefore, each segment is presented as a watershed.

LNVA's assessment area consists of the lower Neches Basin and Neches-Trinity Coastal Basin, encompassing 12 segments or watersheds. The following watershed summaries are presented in the order below.

Lower Neches Basin
Segment 0601 – Neches River Tidal
Segment 0602 – Neches River below B. A. Steinhagen Lake
Segment 0603 – B. A. Steinhagen Lake
Segment 0607 – Pine Island Bayou
Segment 0608 – Village Creek
Segment 0609 – Angelina River below Sam Rayburn Reservoir

Neches-Trinity Coastal Basin
Segment 0701 – Taylor Bayou above Tidal
Segment 0702 – Intracoastal Waterway Tidal
Segment 0703 – Sabine/Neches Canal Tidal
Segment 0704 – Hillebrandt Bayou
Segment 2411 – Sabine Pass
Segment 2412 – Sabine Lake

Maps of each watershed are included along with discussion of impairments, trends, water quality projects and factors that can influence water quality. Data screening results are presented in Appendix A.

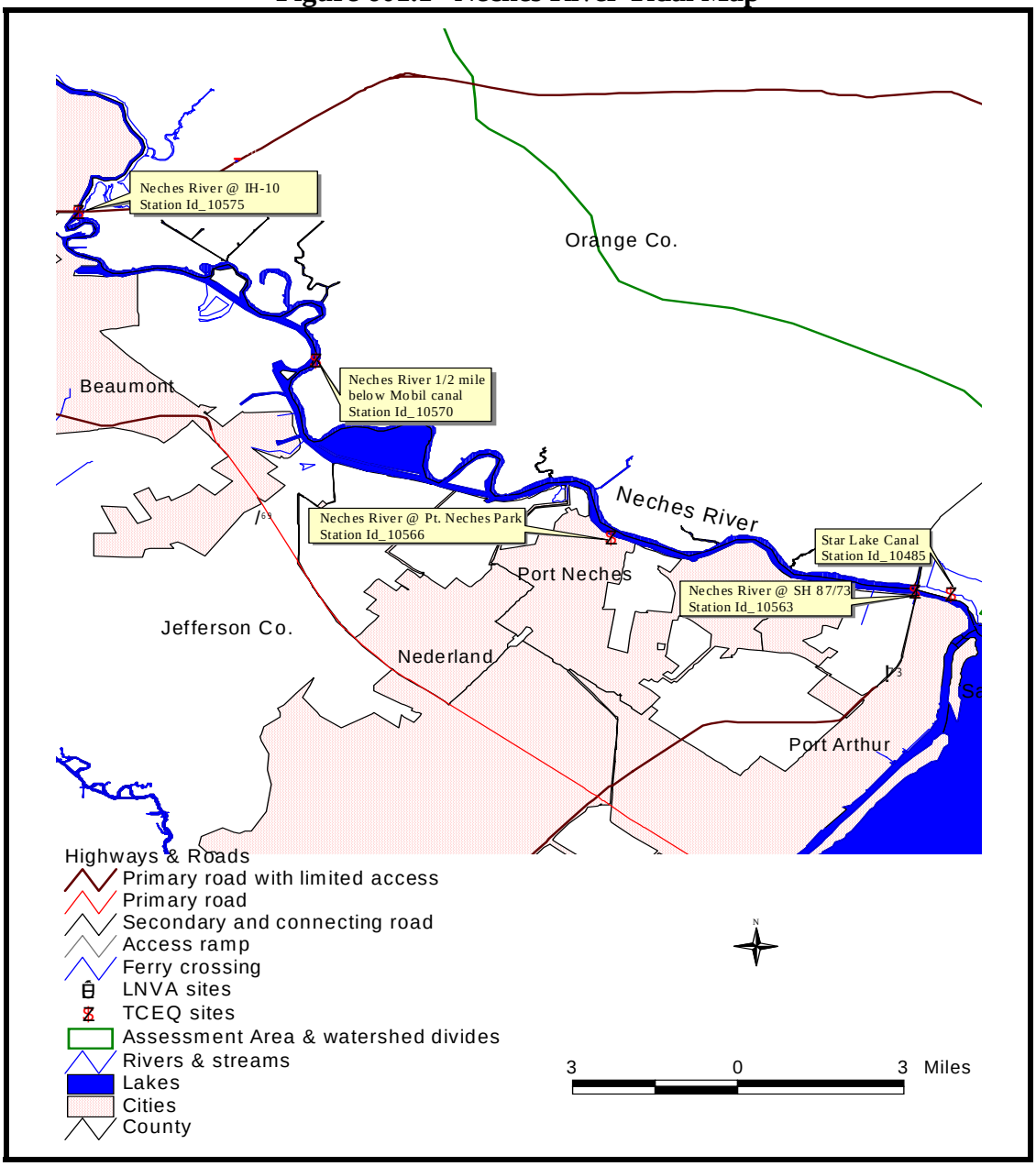
This page left blank intentionally

Segment 0601 – Neches River Tidal

As defined in the Texas Surface Water Quality Standards, Segment 0601 is from the confluence with Sabine Lake in Orange County to a point 11.3 kilometers (7.0 miles) upstream of IH 10 in Orange County. The segment consist primarily of a 40-foot deep navigation channel from the mouth of the river to the Port of Beaumont is maintained by the United States Army Corps of Engineers. Hydrologic influences on the segment include tidal exchange and freshwater inflows.

The Texas Commission on Environmental Quality monitors 5 sites, 4 on segment and 1 off segment, see Figure 601.1.

Figure 601.1 –Neches River Tidal Map



Background

In 1999 the assessment report identified concerns for fecal coliform and nutrients. The lower reach of the segment was listed in the Draft 2002 Water Quality Inventory and 303(d) List as a Tier 1 Primary Concern for the pesticide Malathion (chronic) in water. Simply stated, less than 10 samples available for assessment and some exceedances were identified. The assessment of Malathion should not have been made because only three (3) samples have been collected, not the minimum 4 to 9 samples required to determine Tier 1 Primary Concern.

Assessment Results

Segment 0601 is designated intermediate aquatic life use and contact recreation. Numeric criteria listed in the Texas Surface Water Quality Standards (TSWQS) and nutrient-screening levels can be found in Table 601.1 along with data analyses results. Metals screening levels are listed in Table 601.2, below.

Overall, the water quality in Segment 0601 is good. No concerns were identified for nutrients or chlorophyll. The contact recreational use, as measured by fecal coliform bacteria, is fully supported for the entire segment. General use criteria are fully supported for pH and temperature. Chloride, sulfate and total dissolved solids are not assessed for tidal segments. The aquatic life use is fully supported, as measured by dissolved oxygen.

Results of the data screening identified exceedances of the aquatic life use criterion for Malathion (0.01 µg/L) on tidal streams sites 10485 (Star Lake Canal) and 10563 (Neches River @ SH 87). However, an assessment of support for the aquatic life use could not be made because only 3 samples per site comprise the data set. The small data sets are less than the 4 to 9 samples required to assess whether a Tier 1 Primary Concern exist.

Recommendations

In order to make a full assessment concerning Malathion in water, monitoring by TCEQ Region 10 for organics in water on the Neches River at SH 87 and Star Lake Canal should be maintained.

Continued routine monitoring by TCEQ Region 10 to maintain baseline water quality database, ensuring stream standards and nutrient levels are met.

Table 601.1-Screening Results for Segment 0601

Segment 0601 - Neches River Tidal	Aquatic Life Use			Contact Recreational Use	General Use Support Parameters					Nutrient Impact			
Station Id -Description	Dissolved Oxygen	Metals	Organics	Fecal Coliform	Temperature	pH	Chloride	Sulfate	Total Dissolved Solids	Nitrate + Nitrite (mg/L)	Ammonia-Nitrogen (mg/L)	Total Phosphate (mg/L)	Chlorophyll α (µg/L)
Screening level or Stream Criteria	≥ 3	See Table 601.2	Varies	≤ 400	≤ 35 (95ºF)	6.0-8.5	Not Applicable	Not Applicable	Not Applicable	≤ 1.83	≤ 0.58	≤ 0.71	≤ 19.2
10485 - Star Lake Canal	FS	FS	C	FS	n/a	n/a	n/a	n/a	n/a	no data	NC	NC	NC
10563 - Neches Rv. @ SH 87	FS	FS	C	FS	FS	FS	n/a	n/a	n/a	no data	NC	NC	NC
10566 - Neches Rv. @ Pt. Neches Park	FS	no data	FS	FS	FS	FS	n/a	n/a	n/a	no data	NC	NC	NC
10570 - Neches Rv. 1/2 mi. below Mobil Canal	FS	no data	FS	FS	FS	FS	n/a	n/a	n/a	no data	NC	NC	NC
10575 - Neches Rv. @ IH 10	FS	FS	FS	FS	FS	FS	n/a	n/a	n/a	no data	NC	NC	NC

FS=Full Support, PS=Partial Support, NS=Not Supported, C = Concern, NC=No Concern, n/a=not applicable

Table 601.2-Metals Screening Levels

Metal	***CRP_reporting limit***	***Tidal Acute Screening Level***	***Tidal Chronic Screening Level***
Aluminum	200	-	-
Arsenic	5.0	149	78
Cadmium	0.1	45.4	10
Cr (trivalent)	10.0	-	-
Copper	1.0	13.5	3.6
Lead	0.1	133	5.3
Nickel	10.0	118	13.1
Selenium	2.0	564	136
Silver	0.5	2	-
Zinc	5.0	92.7	84.2

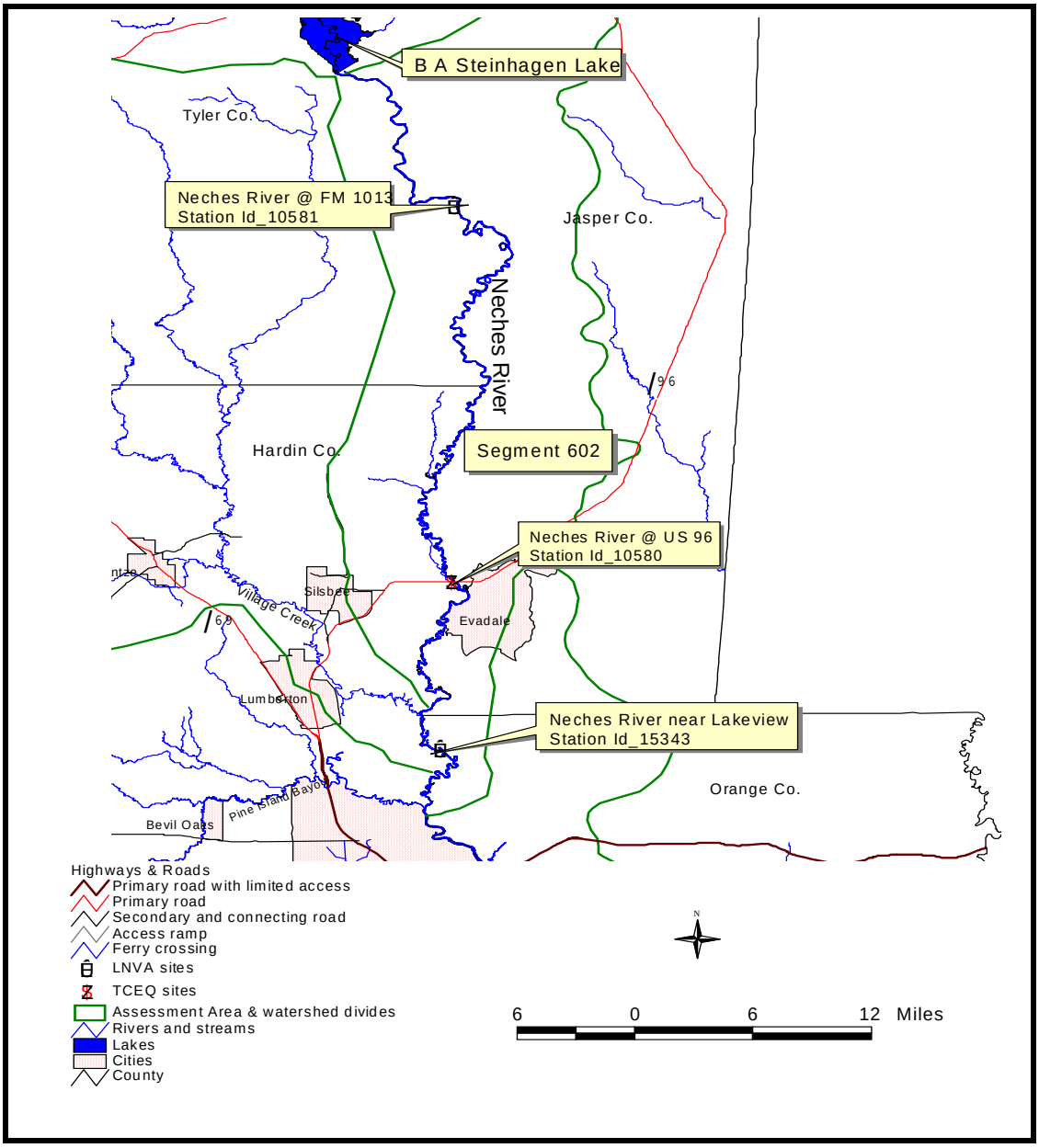
This page left blank intentionally

Segment 0602 – Neches River below B. A. Steinhagen Lake

As defined in the Texas Surface Water Quality Standards, Segment 0602 is from a point 11.3 kilometers (7.0 miles) upstream of IH-10 in Orange County to Town Bluff Dam in Jasper/Tyler County. The segment is 88 miles in length situated in a broad flood plain. Major tributaries include Village Creek and Pine Island Bayou. Stream discharge is regulated by B. A. Steinhagen Lake.

A total of three sites are routinely monitored quarterly by LNVA and TCEQ for field parameters, conventional lab parameters, flow, bacteria and metals in water, see Figure 602.1.

Figure 602.1 –Neches River below B. A. Steinhagen Lake Map



Background

The Big Thicket National Preserve manages four (4) units in Segment 0602. These are the Beaumont Unit, Lower Neches River Corridor Unit, Neches Bottom and Jack Gore Baygall Unit, and the Upper Neches River Corridor Unit.

Within the past 10 years Segment 0602 was noted for some water quality problems. Concerns for various metals in water have been dropped due to uncertainty with the accuracy of the old data, and improved sampling techniques and analytical methods. Additionally, the Texas Department of Health (TDH) issued a fish consumption advisory for the lower reaches of the segment because of dioxin in fish tissue was found. The consumption advisory was rescinded in December 1995. The most recent Basin Summary Report in 1999 found no concerns for the parameters monitored, affirming good water quality for Segment 0602.

Assessment Results

Segment 0602 is designated high aquatic life use, contact recreation and public water supply. Numeric criteria listed in the Texas Surface Water Quality Standards (TSWQS) and nutrient-screening levels can be found in Table 602.1 along with data analysis results. Metals screening levels below are listed in Table 602.2.

Data analysis indicates the segment has good water quality. Contact recreation is fully supported in the entire segment. The general use criteria are fully supported for the following parameters: pH, temperature, chloride, sulfate and total dissolved solids. The aquatic life use as measured by dissolved oxygen is fully supported, and no concerns due to nutrients or chlorophyll.

All dissolved oxygen values collected are greater than the 5.0 mg/L stream standard and range between 5.4 and 11.1 mg/L, with an average of 8.0 mg/L. Temporal plots of Neches River @ FM 1013 and Neches River near Lakeview indicate expected seasonal trends with lowest values during the warm, dry months. Figure 602.2 illustrates the seasonal trends with representative sites in the segment.

Figure 602.2-Seasonal Trend of DO

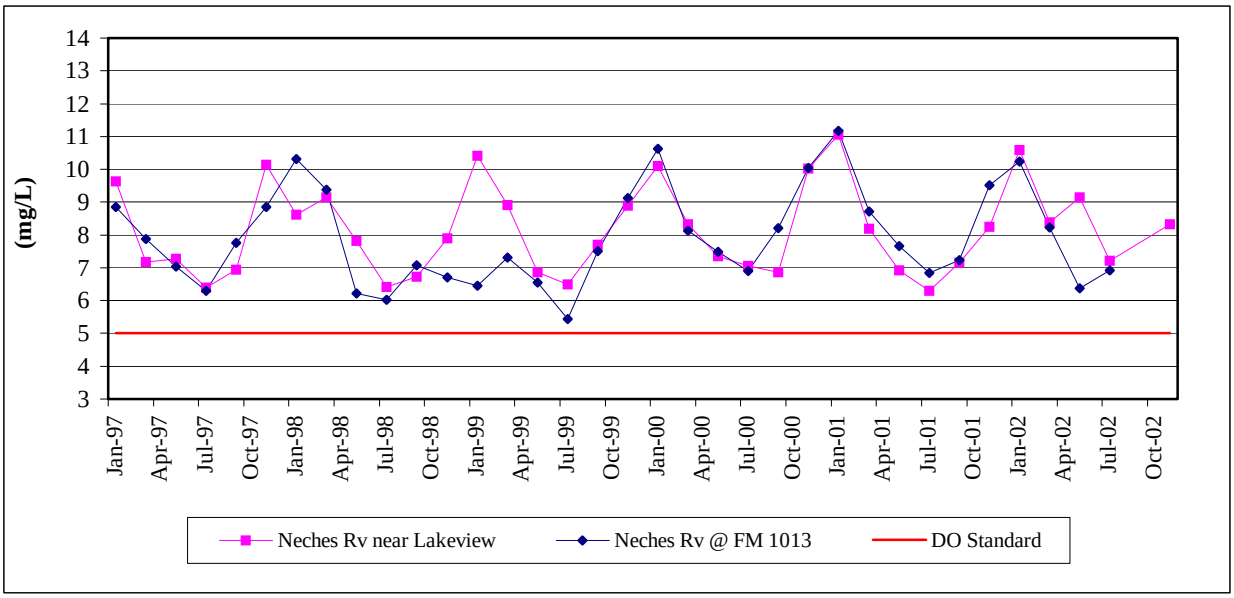
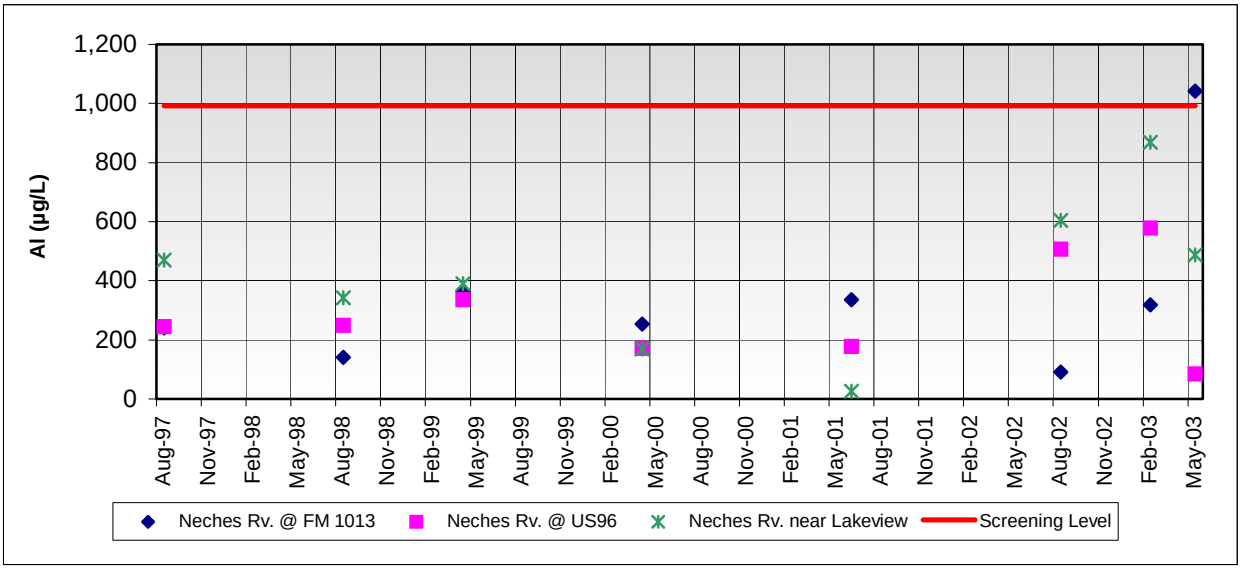


Figure 602.2 is a plot of dissolved oxygen (DO) concentrations with time. Fluctuations in DO occur seasonally but only a slight increasing trend is noted.

Data screening results also identified partial support of aquatic life use for the acute aluminum criterion on Neches River at FM 1013. One sample concentration (1,042 µg/L) of eight exceeded the acute criterion of 991 µg/L (see Figure 602.3). Except for the one high value, aluminum concentrations at this site range from 91 to 363 µg/L. Aluminum is a common element of clay and is considered naturally occurring in the assessment area.

Figure 602.3-Historical Aluminum Levels



Recommendations

LNVA is researching the high aluminum concentration detected and will split metals in water samples between laboratories to verify results beginning FY 2004.

LNVA and TCEQ will also continue routinely monitoring the segment to maintain the baseline water quality database, and ensure stream standards and nutrient levels are met.

Table 602.1-Screening Results for Segment 0602

Segment 0602 - Neches River below B. A. Steinhagen Lake	Aquatic Life Use			Contact Recreational Use	General Use Support Parameters					Nutrient Impact			
Station Id -Description	Dissolved Oxygen	Metals in Water	Organics in Water	Fecal Coliform	Temperature	pH	Chloride	Sulfate	Total Dissolved Solids	Nitrate + Nitrite (mg/L)	Ammonia-Nitrogen (mg/L)	Total Phosphate (mg/L)	Chlorophyll α (µg/L)
Screening level or Stream Criteria	≥ 5	See Table 602.2	Varies	≤ 400	≤ 33ºC (91ºF)	6.0-8.5	≤ 50	≤ 50	≤ 200	≤ 2.76	≤ 0.17	≤ 0.8	≤ 11.6
10580 - Neches Rv. @ US 96	FS	FS	no data	FS	FS	FS	FS	FS	FS	no data	NC	NC	NC
10581 - Neches Rv. @ FM 1013	FS	PS	no data	FS	FS	FS	FS	FS	FS	NC	NC	NC	no data
15343 - Neches Rv. near Lakeview	FS	FS	no data	FS	FS	FS	FS	FS	FS	NC	NC	NC	no data

FS=Full Support, PS=Partial Support, NS=Not Supported, C = Concern, NC=No Concern, n/a=not applicable

Table 602.2-Metals Screening Levels for Segment 0602

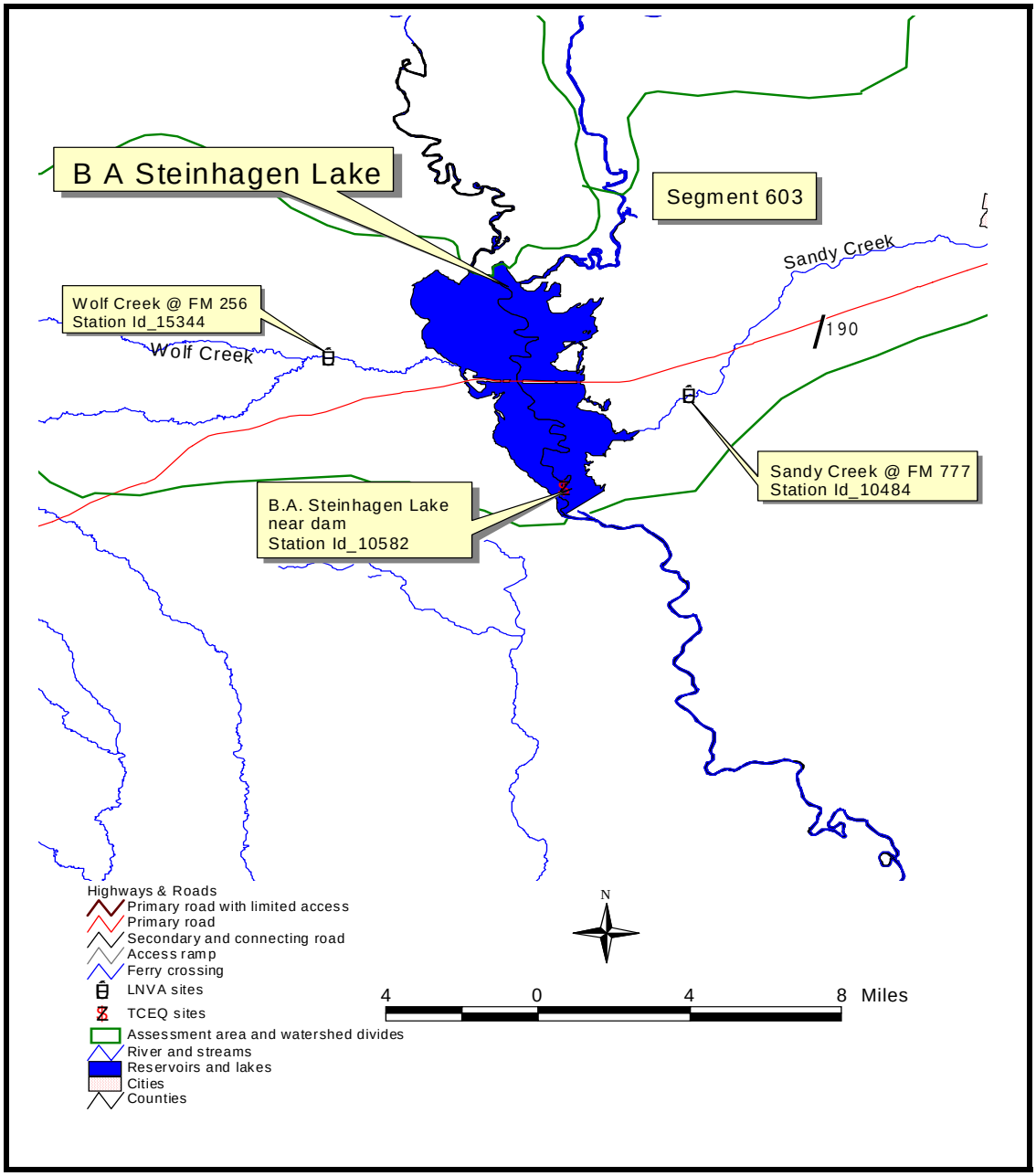
Metal	*CRP_reporting limit*	*Acute screening level*	*Chronic screening level*
Aluminum	200	991	-
Arsenic	5.0	360	190
Cadmium	0.1	8.02	0.51
Cr (trivalent)	10.0	612.21	72.97
Copper	1.0	5.78	4.31
Lead	0.1	16.15	0.63
Nickel	10.0	483.11	53.71
Selenium	2.0	20	5
Silver	0.5	0.92	-
Zinc	5.0	39.80	36.05

This page left blank intentionally

Segment 0603 – B. A. Steinhagen Lake

The lake constitutes the segment up to the normal pool elevation of 83 feet above mean sea level. Major tributaries to the segment include the Neches and Angelina Rivers, which make up Segments 604 and 609, respectively. LNVA performs routine quarterly monitoring for Segment 0603 are on Sandy Creek and Wolf Creek, while a site on the lake is monitored by TCEQ Region 10 (Figure 603.1).

Figure 603.1 –B. A. Steinhagen Lake Map



Background

Segment 0603 is situated in the south-central portion of the Western Gulf Coastal Plain eco-region. This area lies within the transition zone between the hilly region to the north and the relatively flat gulf coast region to the south. Topographically, the area is gently rolling with local relief generally less than 50 feet. Bedrock is sedimentary consisting of alternating series of unconsolidated sand and clay strata. The more resistant clay strata control the topography forming low east-west trending hills.

The reservoir has a surface area of 13,700 acres. Tributaries in this segment, other than the Neches and Angelina Rivers, are Wolf and Sandy Creeks. Wolf Creek drains areas of pine forest and pastureland. Sandy Creek is also a forested sub-watershed with pasturelands and its upper reaches drain the City of Jasper.

Assessment Results

Segment 0603 is designated high aquatic life use, contact recreation and public water supply. Numeric criteria listed in the Texas Surface Water Quality Standards (TSWQS) and nutrient-screening levels can be found in Table 603.1 along with data analysis results. Metals screening levels below are listed in Table 603.2.

Segment 0603 fully supports the Aquatic Life Use for dissolved oxygen and dissolved metals in water.

General use criteria are fully supported for the following parameters: pH, temperature, chloride, sulfate and total dissolved solids. See Appendix B for data screening results tables.

No concern due to nutrients or chlorophyll a.

Texas Department of Health issued a fish consumption advisory in 1995 after elevated levels of mercury were found in largemouth bass, freshwater drum, white bass and hybrid/striped bass. Segment 0603 is listed on the state's 303(d) list as a moderate priority for a Total Maximum Daily Load (TMDL) due to mercury in fish tissue. The issue of mercury in fish tissue is regional, encompassing other water bodies in east Texas in addition to B.A. Steinhagen Lake and Sam Rayburn Reservoir. TCEQ may group these water bodies as one TMDL project due to the similar nature. According to the Draft 2002 TMDL schedule, the mercury in fish tissue for this segment is underway with funding from the state's general revenue. The project is targeted for completion and submittal to the USEPA for approval after 2005. The levels of mercury contamination in fish tissue are the result of bioaccumulation. There is no risk to the public in other recreational activities in the segment. Mercury concentrations in the water column have never been detected from samples collected by LNVA and contamination of a public water supply is not an issue.

Contact recreational use is not supported on Sandy Creek at FM 777 (Station Id. 10484), with 26% of the data exceeding the 400 colonies per 100 milli-liter (mL) bacteria screening level. Partial support for contact recreational use is not assessed; that is a site either fully supports (<25 % exceedances) or does not support (>25 % exceedances) the use. Wolf Cr @ FM 256 (Station Id. 15344) fully supports contact recreational use. It is noteworthy that 21% of the data on Wolf Creek exceeded the screening level. Figure 603.2 shows the fecal coliform bacteria trend for both sample sites. Samples collected since 2001 have not exceeded the screening criterion with the frequency observed from 1997 through 200. The Clean Rivers Program is now collecting *E.coli* samples since it is a better indicator of bacteria from human origins for use in the next assessment.

Figure 603.2-Historical Fecal Coliform Levels

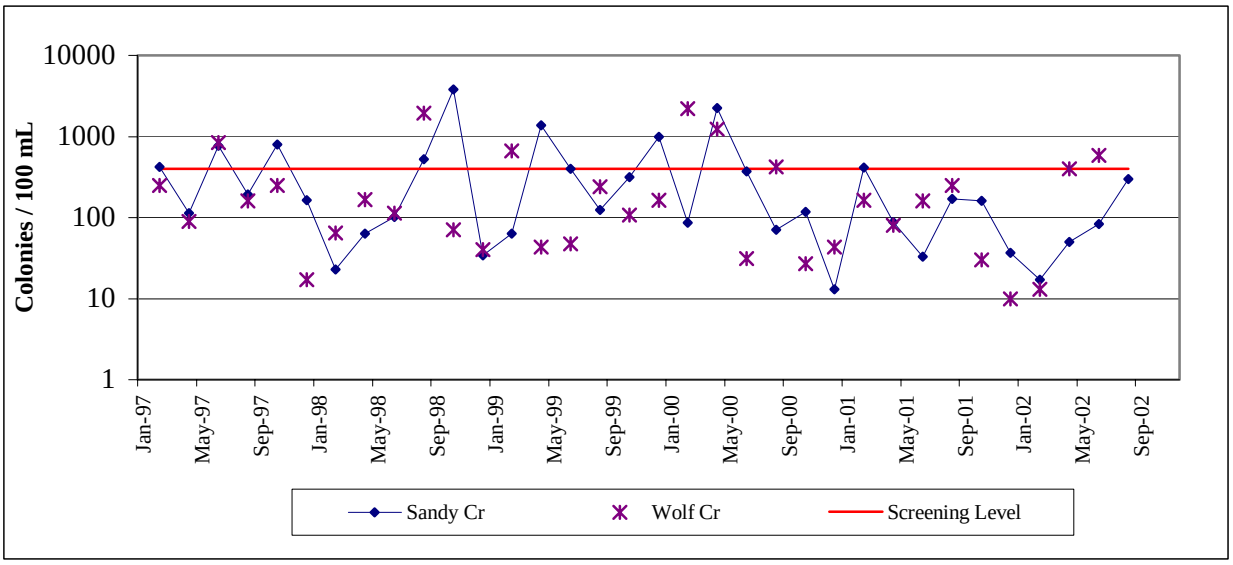
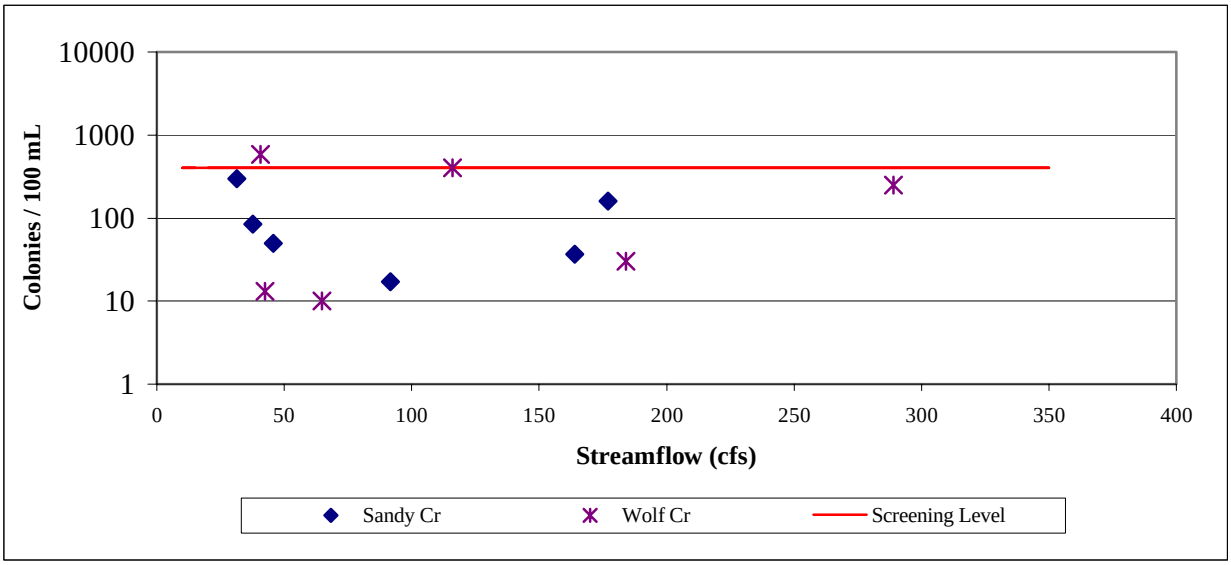


Figure 603.3 is a scatter of the fecal coliform bacteria data plotted against streamflow recorded at the time of sampling. The graph only includes bacteria samples collected with an associated flow. Generally, an increase in bacteria when flow increases may signal non-point source as the origin, while a decrease in bacteria when flow increases is characteristic of a point source. Note the cluster of data from both sites at streamflow around 50 cfs. With both high and low bacteria colony results occurring at similar streamflow amounts, no determination of source can be made and further investigation is necessary.

Figure 603.3-Fecal Coliform vs Streamflow Plot



Recommendation

LNVA along with TCEQ Region 10 will continue to coordinate routine monitoring in the segment. LNVA will endeavor to develop a strategy to identify source(s) of elevated bacteria with updated GIS coverage of landuse and point source discharges.

According to the Draft 2002 TMDL schedule, the mercury in fish tissue for this segment is underway with funding from the state's general revenue. The project is targeted for completion and submittal to the USEPA for approval after 2005. LNVA will support and assist TCEQ with this project as needed.

Table 603.1-Screening Results for Segment 0603

Segment 0603 - B. A. Steinhagen Lake	Aquatic Life Use			Contact Recreational Use	General Use Support Parameters					Nutrient Impact			
Station Id -Description	Dissolved Oxygen	Metals in Water	Organics in Water	Fecal Coliform	Temperature	pH	Chloride	Sulfate	Total Dissolved Solids	Nitrate + Nitrite (mg/L)	Ammonia-Nitrogen (mg/L)	Total Phosphate (mg/L)	Chlorophyll (µg/L)
Screening level or Stream Criteria	≥ 5	See Table 603.2	Varies	≤ 400	≤ 34ºC (93ºF)	6.0-8.5	≤ 50	≤ 50	≤ 200	≤ 0.32	≤ 0.106	≤ 0.18	≤ 21.4
10582 - B. A. Steinhagen Lake near Dam	FS	no data	no data	FS	FS	FS	FS	FS	FS	no data	NC	NC	NC
10484 - Sandy Ck. @ FM 777	FS	FS	no data	NS	n/a	n/a	n/a	n/a	n/a	NC	NC	NC	no data
15344 - Wolf Ck. @ FM 256	FS	FS	no data	FS	n/a	n/a	n/a	n/a	n/a	NC	NC	NC	no data

FS=Full Support, PS=Partial Support, NS=Not Supported, C = Concern, NC=No Concern, n/a=not applicable

Table 603.2-Metals Screening Levels for Segment 0603

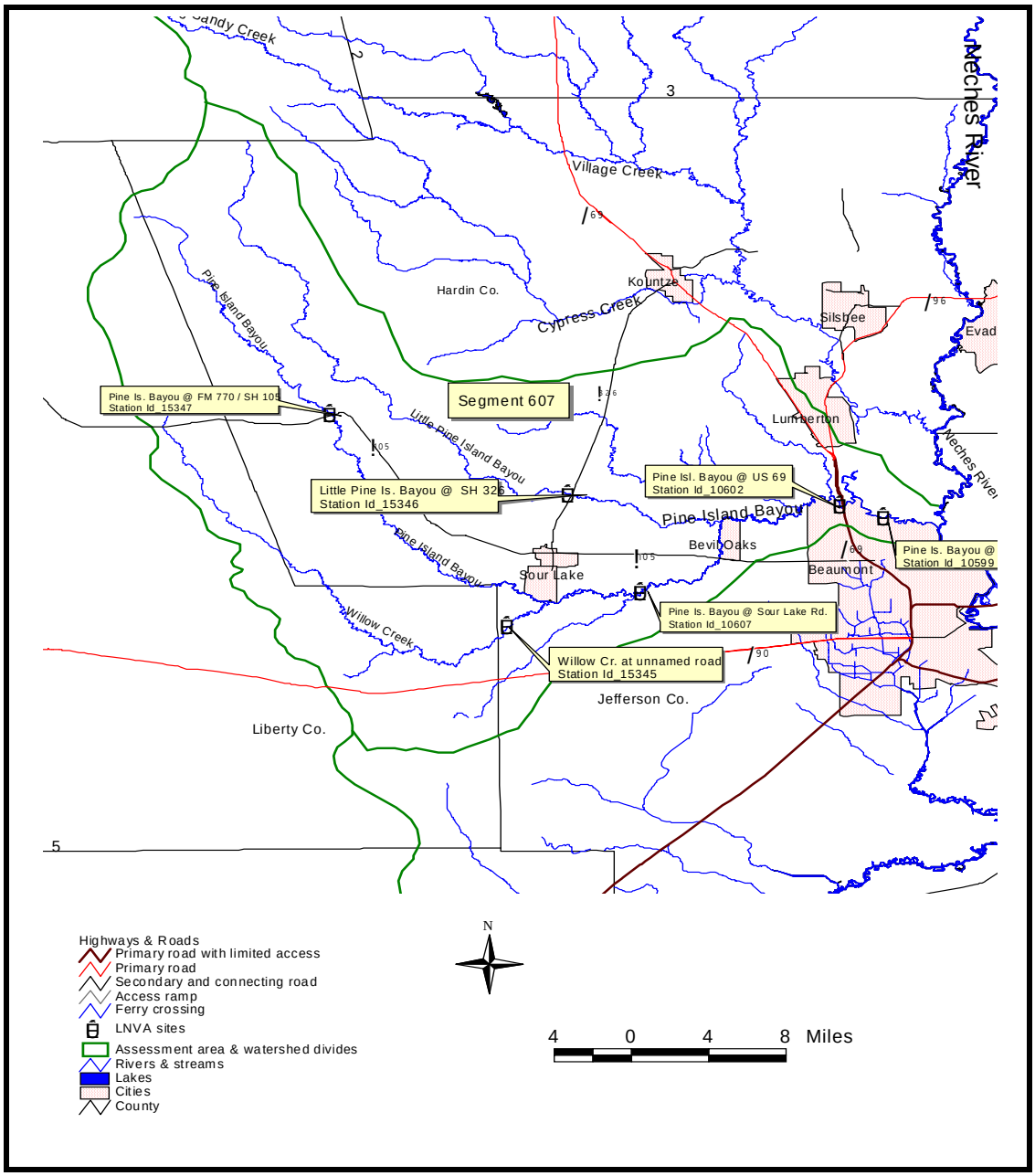
Metal	*CRP_reporting limit*	*Acute screening level*	*Chronic screening level*
Aluminum	200	991	-
Arsenic	5.0	360	190
Cadmium	0.1	8.02	0.51
Cr (trivalent)	10.0	612.21	72.97
Copper	1.0	5.78	4.31
Lead	0.1	16.15	0.63
Nickel	10.0	483.11	53.71
Selenium	2.0	20	5
Silver	0.5	0.92	-
Zinc	5.0	39.80	36.05

This page left blank intentionally

Segment 0607 – Pine Island Bayou

As defined in the Texas Surface Water Quality Standards, Segment 0607 is from the confluence with the Neches River in Hardin/Jefferson County to FM 787 in Hardin County. Major tributaries include Little Pine Island Bayou and Willow Creek (Figure 607.1). Six sites are monitored quarterly, two of which are considered off segment.

Figure 607.1 – Pine Island Bayou Map



Background

Pine Island Bayou has a drainage area of 657 square miles. The segment is a natural streambed with sand and clay substrate from its headwaters to its confluence with the Neches River. Little Pine Island Bayou and Willow Creek are the only major tributaries to the segment. The upper reaches of Pine Island Bayou bisect mainly forestland through approximately 71% of the watershed. The lower reaches drain the communities of Sour Lake, Pinewood Estates, Bevil Oaks and the northern section of the City of Beaumont.

Recent assessment identified concerns for dissolved oxygen, pH and fecal coliform bacteria. Conclusions from the 1999 assessment found a correlation with flow and the parameters of concern listed above. High fecal coliform bacteria and low pH predominated during high flow periods, while low dissolved oxygen concentrations occurred during low flow summer months. These environmental conditions continue to be observed.

Assessment Results

Segment 0607 is designated high aquatic life use, contact recreation and public water supply. Numeric criteria listed in the Texas Surface Water Quality Standards (TSWQS) and nutrient-screening levels can be found in Table 607.1 along with data analysis results. Metals screening levels are listed in Table 607.2, below.

Aquatic life use, as measured by dissolved oxygen (DO) is not supported at Pine Island Bayou at FM 770, Pine Island Bayou at Sour Lake Rd, Willow Creek at an unnamed road and Little Pine Island Bayou at SH 326. Partial support for dissolved oxygen criterion was identified at the two downstream sites, Pine Island Bayou at US 69 and Pine Island Bayou at LNVA #1, Figure 607.1.

The segment consists of low gradient, sluggish streams where dissolved oxygen levels are subject to seasonal variance, see Figure 607.2. Values plotted are monthly averages of DO measurements from three sites since 1997. The graph clearly illustrates the depression of DO through the warmest and driest months of each year.

Table 607.1-Screening Results for Segment 0607

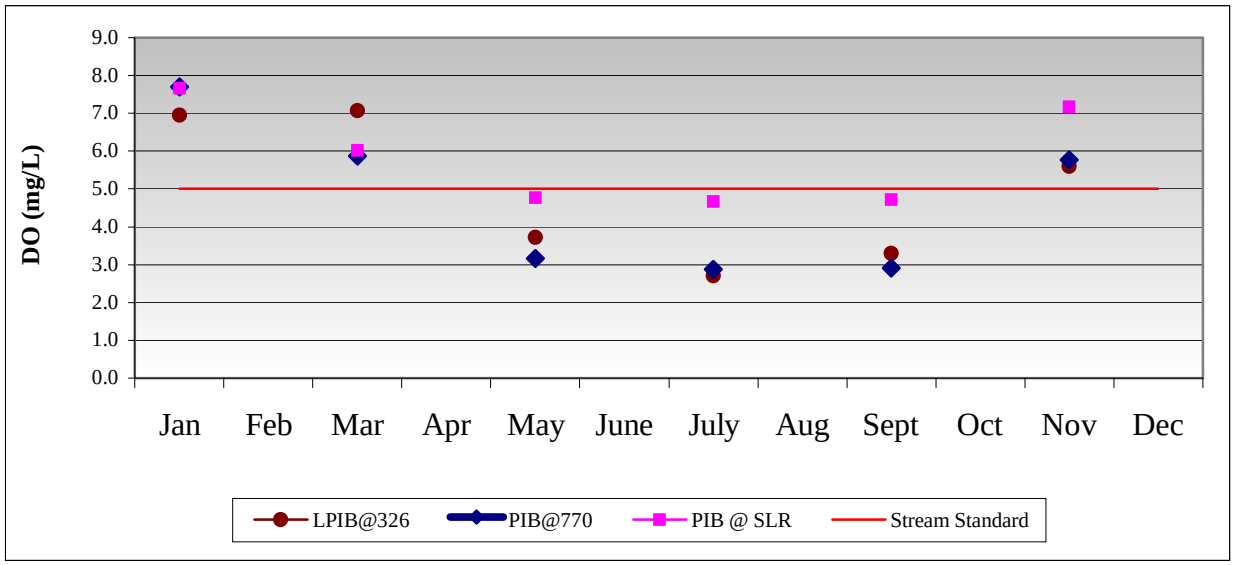
Segment 0607 - Pine Island Bayou	Aquatic Life Use			Contact Recreational Use	General Use Support Parameters					Nutrient Impact			
Station Id -Description	Dissolved Oxygen	Metals in Water	Organics in Water	Fecal Coliform	Temperature	pH	Chloride	Sulfate	Total Dissolved Solids	Nitrate + Nitrite (mg/L)	Ammonia-Nitrogen (mg/L)	Total Phosphate (mg/L)	Chlorophyll α (µg/L)
Screening level or Stream Criteria	≥ 5	See Table 607.2	Varies	≤ 400	≤ 34ºC (93ºF)	6.0-8.5	≤ 150	≤ 50	≤ 300	≤ 2.76	≤ 0.17	≤ 0.8	≤ 11.6
15367 - Pine Is. Bayou @ FM 770	NS	NS	no data	FS	FS	FS	FS	FS	FS	NC	NC	NC	no data
15345 - Willow Ck. @ unnamed Rd.	NS	NS	no data	FS	n/a	n/a	n/a	n/a	n/a	NC	NC	NC	no data
10607 - Pine Is. Bayou @ Old Sour Lk. Rd.	NS	NS	no data	FS	FS	FS	FS	FS	FS	NC	NC	NC	no data
15346 - Little Pine Is. Bayou @ SH 326	NS	NS	no data	FS	n/a	n/a	n/a	n/a	n/a	NC	NC	NC	no data
10602 - Pine Is. Bayou @ US 69	PS	NS	no data	FS	FS	FS	FS	FS	FS	NC	C	NC	no data
10599 - Pine Is. Bayou @ LNVA 1	PS	PS	no data	FS	FS	FS	FS	FS	FS	NC	NC	NC	no data

FS=Full Support, PS=Partial Support, NS=Not Supported, C = Concern, NC=No Concern, n/a=not applicable

Table 607.2-Metals Screening Levels for Segment 0607

Metal	*CRP_reporting limit*	*Acute screening level*	*Chronic screening level*
Aluminum	200	991	-
Arsenic	5.0	360	190
Cadmium	0.1	8.02	0.51
Cr (trivalent)	10.0	612.21	72.97
Copper	1.0	5.78	4.31
Lead	0.1	16.15	0.63
Nickel	10.0	483.11	53.71
Selenium	2.0	20	5
Silver	0.5	0.92	-
Zinc	5.0	39.80	36.05

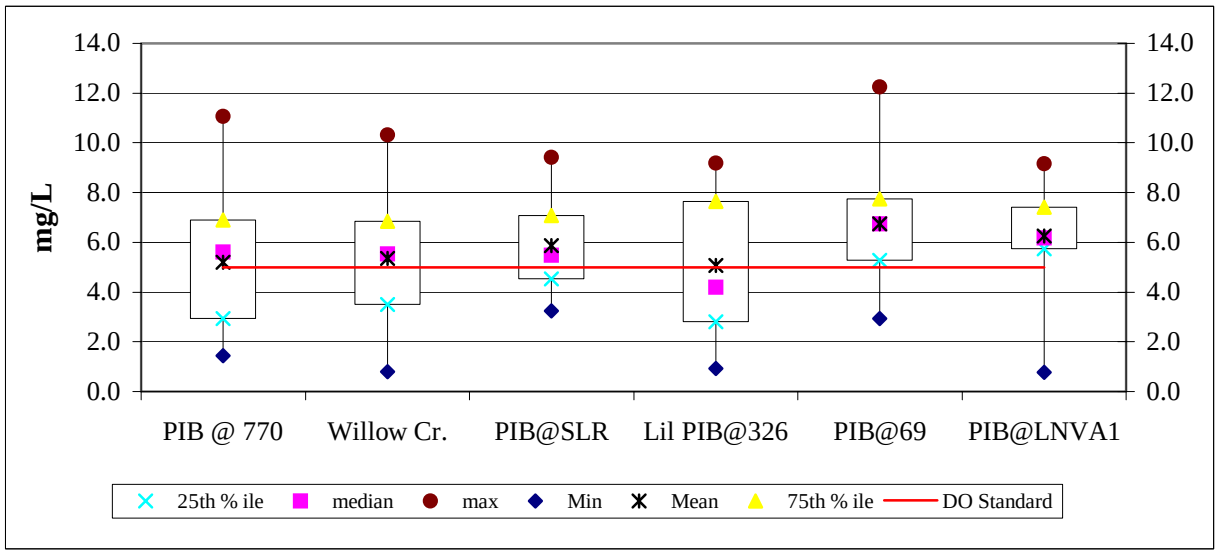
Figure 607.2-Seasonality of Dissolved Oxygen



Low dissolved oxygen (DO) concentrations are present segment wide (Figure 607.3) and have repeatedly kept the segment on the state's 303(d) list. Persistent low dissolved oxygen levels in the watershed are probably due to natural causes (high ambient summer temperatures, low velocities and decaying forest material).

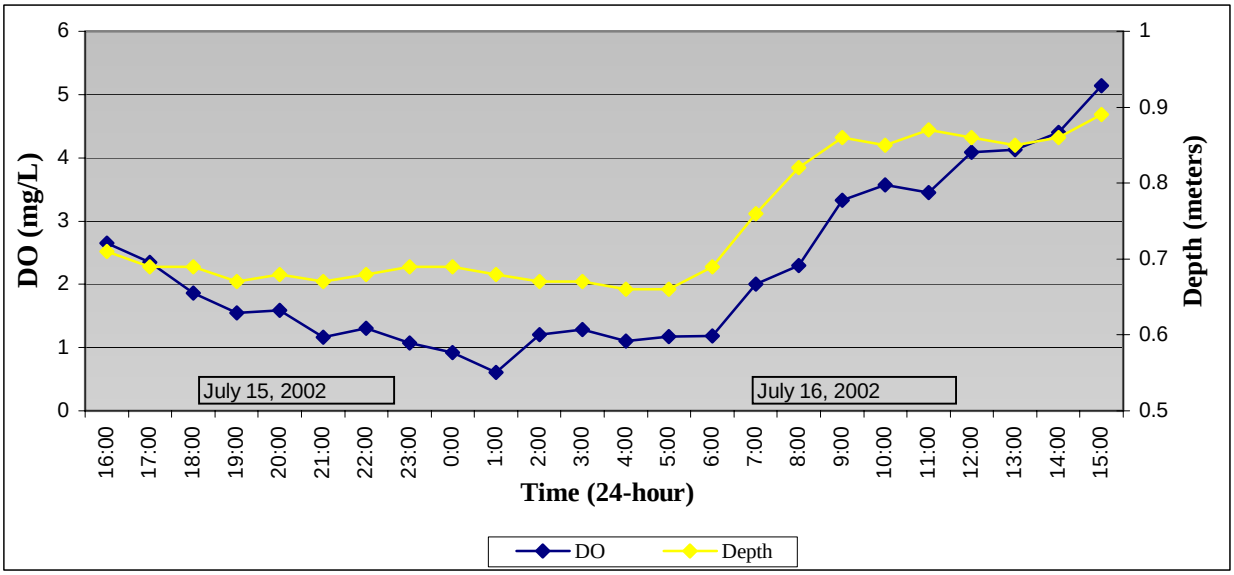
Figure 607.3 illustrates the range, percentiles (a value at which the respective percentage of the data will be less than) and average of dissolved oxygen measurements recorded during routine monitoring in the Pine Island Bayou watershed.

Figure 607.3-Range of Dissolved Oxygen Concentrations



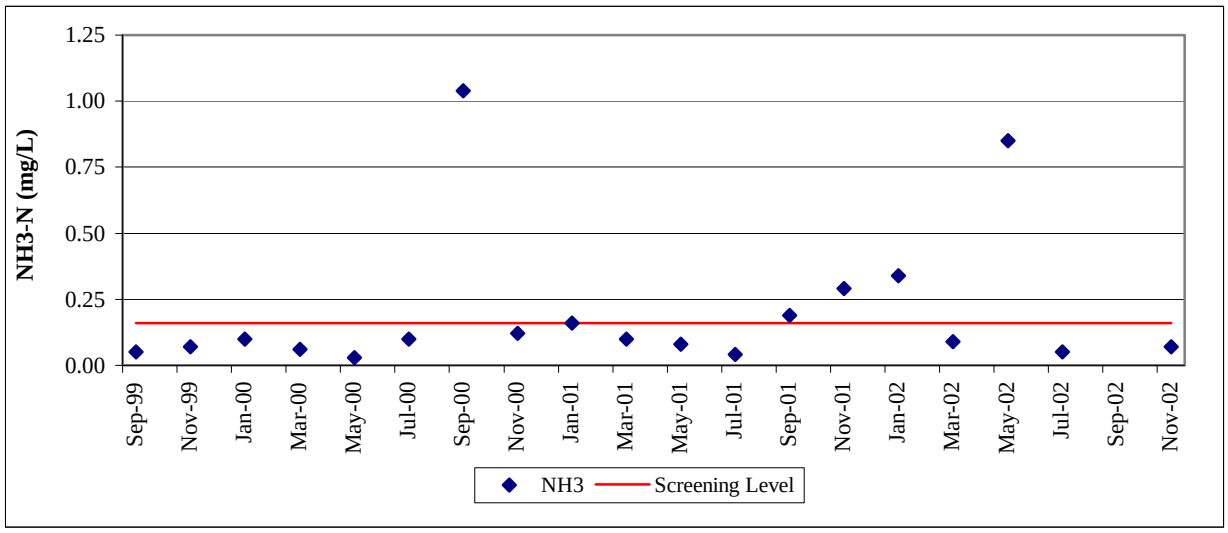
In April 2002 LNVA began a two-year DO study to collect 24-hour data and verify non-support of the DO standard. Because the data set collected thus far is less than the minimum 10 set required, the aquatic life use for 24 hour DO cannot be assessed. However, prelimenary results of the study reveal that the upper portion of the segment typically failed to reach the stream standard, while the mid-segment sites maintained average DO levels above 5 mg/L about 50% of the time. The two lower most sites monitored were influenced by tidal fluctuations pushing Neches River water up Pine Island Bayou. As noted in previous assessments, dissolved oxygen concentration and streamflow are directly proportional. In Figure 607.4 the 24-hour measurements show an increase flow is represented by water depth.

Figure 607.4-24 hour DO and Depth



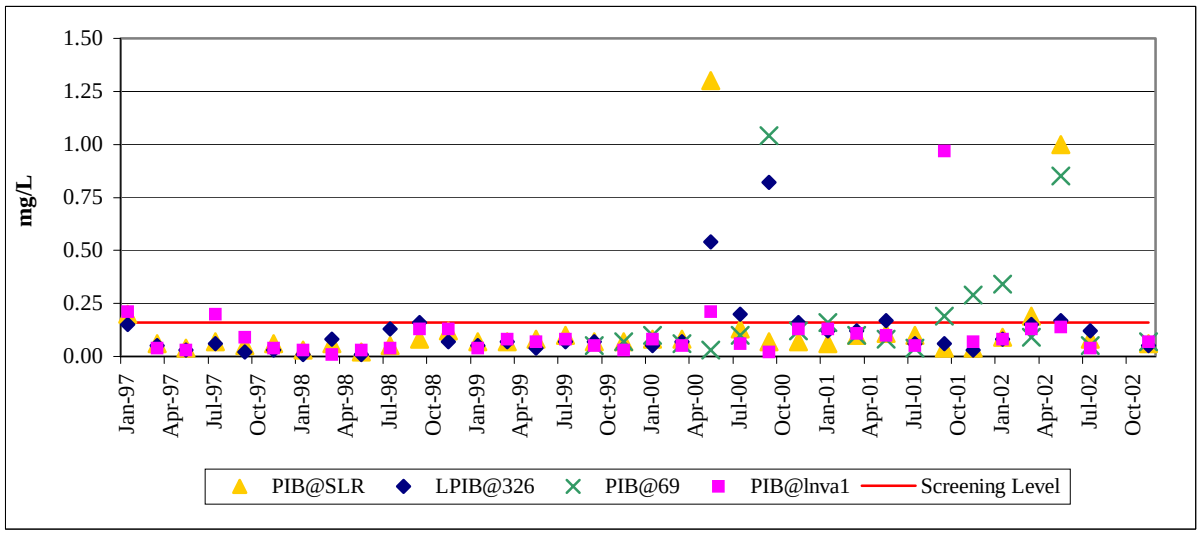
A concern was also identified for ammonia-nitrogen (NH3-N) at Pine Island Bayou at US 69 (Station Id_10602). Screening results show 26% of the data exceed the NH3-N screening level of 0.16 mg/L. Figure 607.5 is a temporal plot of the data with screening level. No correlation was found between NH3-N and streamflow.

Figure 607.5-NH3 Trend



This site is influeced by tidal fluctuations. Comparing sampling events when exceedances occur between sites upstream and downstream of US 69 yield no indication of the NH3-N source. Figure 607.6 illustrate the historical randomness among sites when exceedances occur upstream and downstream of US 69 compared to the screening level.

Figure 607.6-Historical NH3 Levels

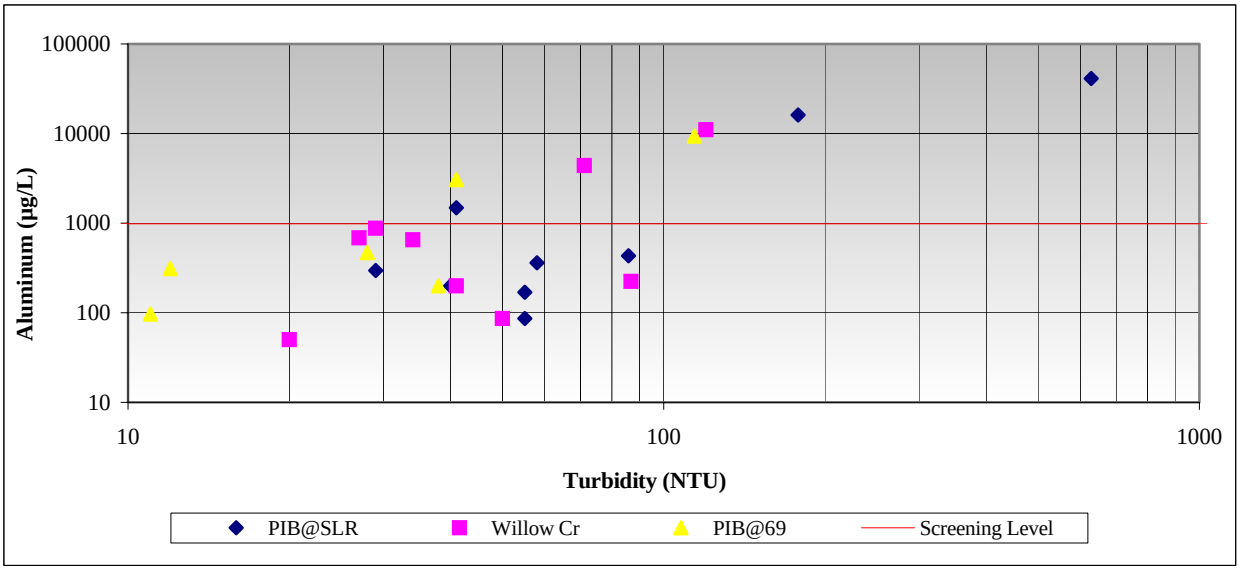


Screening results of metals in water indicated both partial and non support of aquatic life use for the following:

Aluminum (acute) – Non support at all sites except for Pine Is. Bayou at LNVA #1 which obtained partial support.
Cadmium (chronic) – Non support at Pine Is. Bayou at Sour Lk. Road and Pine Is. Bayou at US 69.
Lead (chronic) – Non support all sites.
Zinc (acute) – Partial support at Pine Is. Bayou at Sour Lk. Road and Pine Is. Bayou at US 69.

Aluminum is a common element in clay soils. Clay soils and stream substrate are common throughout the Pine Island Bayou watershed. Figure 607.7 illustrates the correlation of aluminum content in the water column and the amount of suspended clay sediment as measured by turbidity at selected sites in the watershed. The amount of aluminum in the water is directly proportional to the turbidity level.

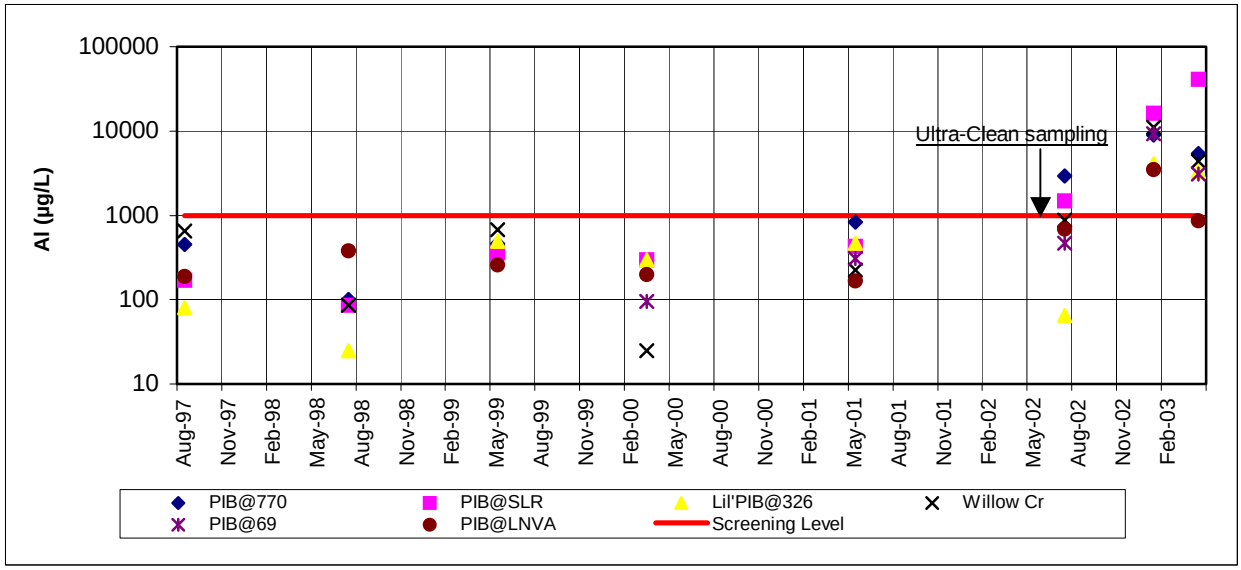
Figure 607.7-Aluminum vs Turbidity Plot



It is important to note an increase of aluminum concentrations coincide with a new sampling and analysis technique. Since late 2002 LNVA has employed an ultra-clean metals sampling and analysis technique to achieve lower reporting limits of metals required by the Clean Rivers Program. LNVA is investigating the occurrence of elevated aluminum by splitting samples between laboratories to verify results.

Figure 607.8, below, is a plot of historical aluminum concentrations in Segment 0607, illustrating the occurrence of elevated aluminum concentrations coincide with the new sampling technique employed.

Figure 607.8-Historical Aluminum Levels



Natural sources of cadmium, lead and zinc are not as easily identified in the assessment area. Some manmade products containing these metals are listed below.

Cadmium	**Lead**	**Zinc**
Batteries	Paint chips/dust	household appliances
Stabilizer for PVC	from buildings, bridges	galvanized steel
Pigments in plastics and paint goods	and other metal structures	tires and rubber
Electroplating equipment	Industrial emissions	automotive

No correlations were found to explain the conditions prevalent when high concentrations of lead and cadmium metals occur.

Results obtained before the new ultra-clean sampling technique were reported as non-detections (or less than values) but the level of detection was still higher than the screening levels for many metals. For assessment purposes, these non-detects were assessed as one half of the detection level or screening criteria, which ever was lowest. Figures 607.9 and 607.10 are spatial plots of cadmium and lead, respectively. Figure 607.11 is a temporal plot of zinc samples in the watershed.

Figure 607.9-Average Cadmium Levels

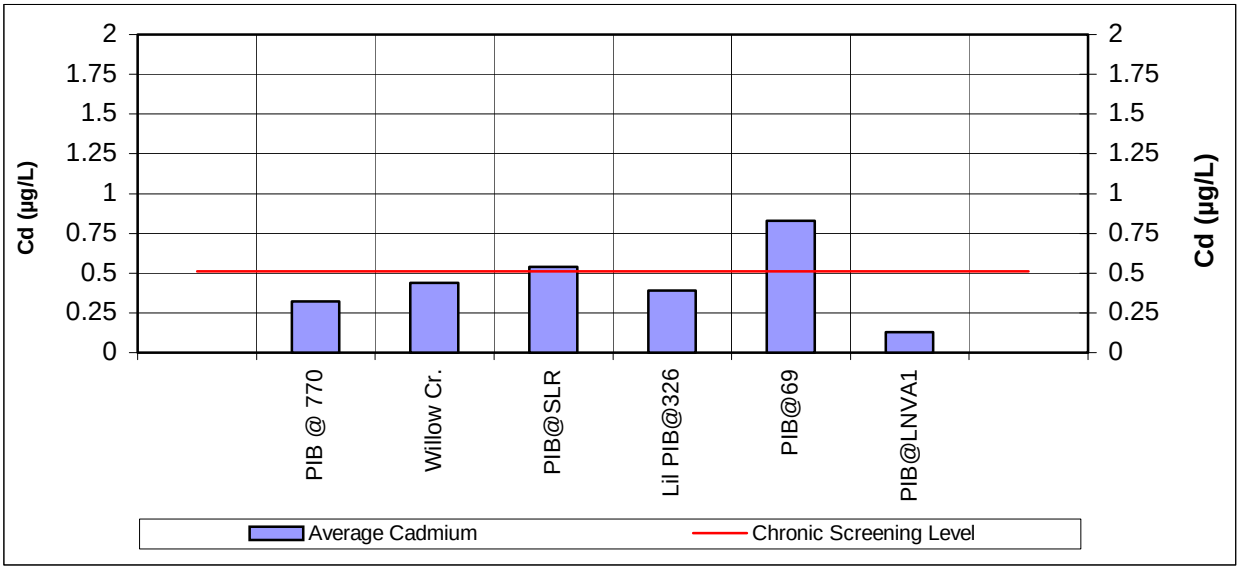


Figure 607.9 shows the calculated average of dissolved cadmium in water throughout the segment. Beginning summer 2002 the ultra-clean sample collection technique was employed and significantly lower concentrations of cadmium were found.

Figure 607.10-Average Lead Levels

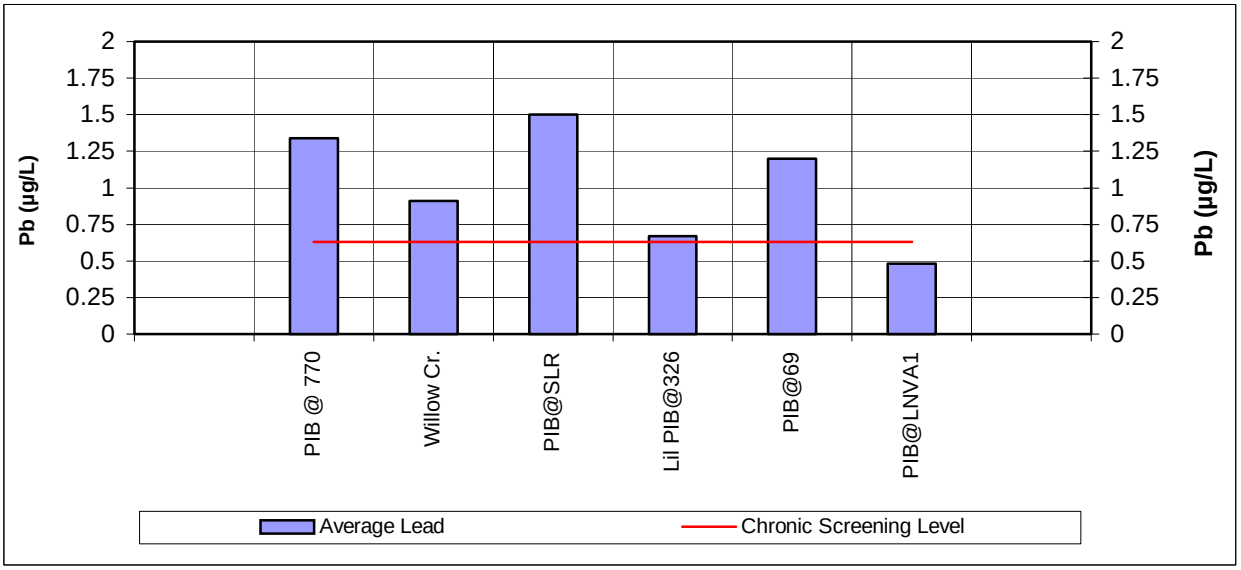


Figure 607.10 represents the spatial trend of lead in Pine Island Bayou. In the summer 2002 LNVA began employing the ultra-clean sample collection technique and have found increased lead concentrations.

Figure 607.11-Historical Zinc Levels

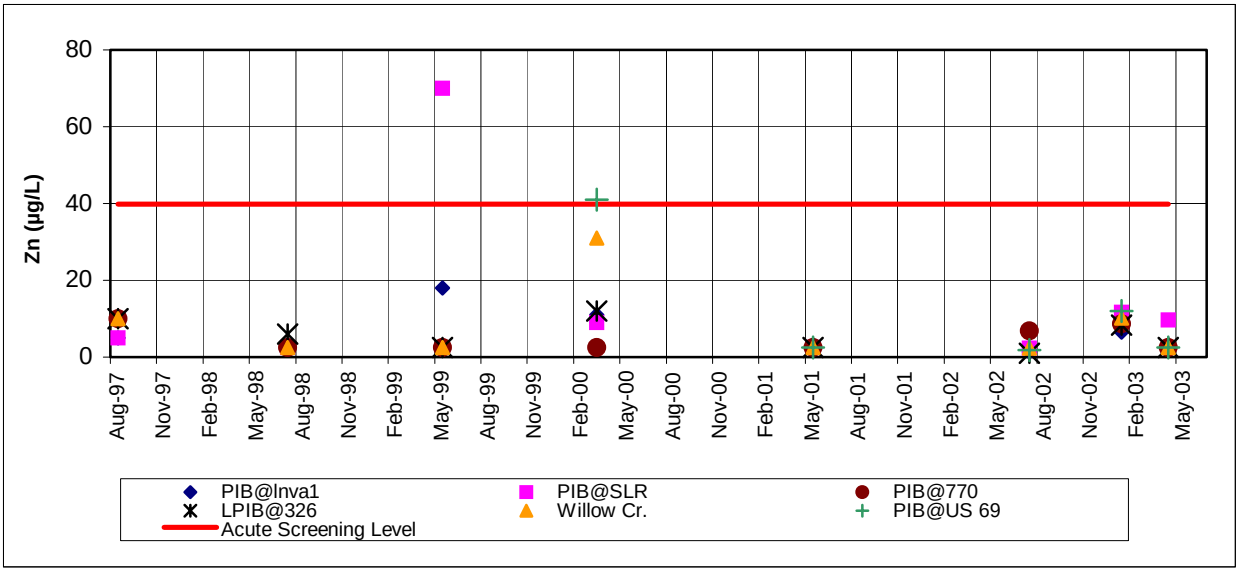


Figure 607.11 is a temporal plot of zinc at all sites monitored in the watershed. Since utilizing the ultra-clean sampling technique all zinc results have been less than 15 µg/L, or ppb.

Recommendations

Because natural conditions maybe the mechanism controlling the low dissolved oxygen (DO) levels, a total maximum daily load (TMDL) project would produce stringent limits on permittees in the watershed and would not alleviate the problem. The need for a Use Attainability Analysis (UAA) was discussed and scheduled at LNVA's FY 2004 coordinated monitoirng meeting. The purpose of a UAA is to determine if established aquatic life use designation and DO criterion are appropriate, and if not, adjust the stream standard for the segment accordingly. TCEQ, with assistance from LNVA, will collect data to support the UAA during the summers of 2004 and 2005.

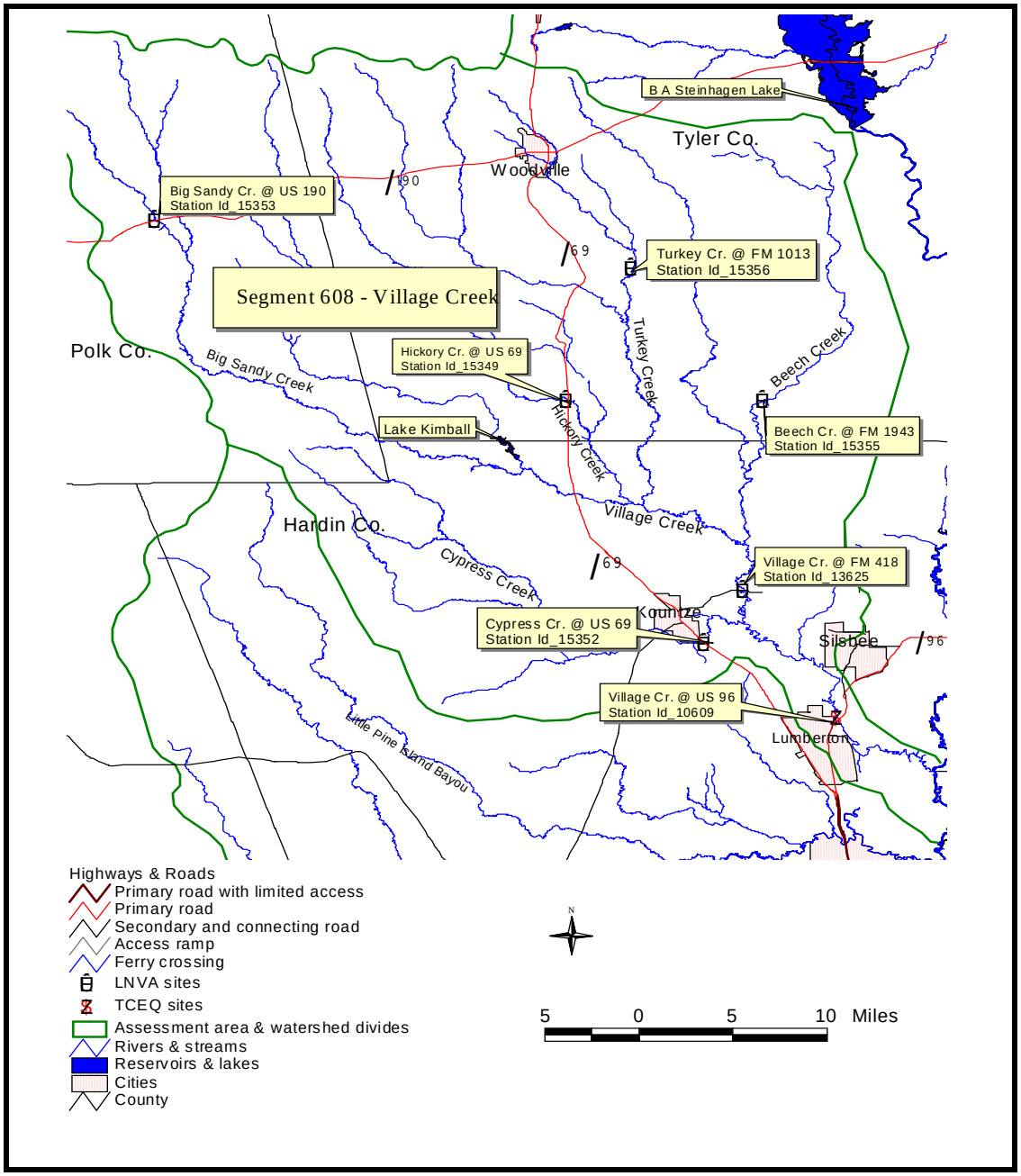
The low pH values are most likely due to natural factors (decaying forest material) and will be addressed during the scheduled UAA.

LNVA is working with TCEQ to secure funds for more sampling of metals in water to determine the source(s). LNVA is also researching the high aluminum concentration detected and will split samples between laboratories to verify results.

Segment 0608 – Village Creek

Segment 0608 – Village Creek is defined in the *Texas Surface Water Quality Standards* as from the confluence with the Neches River in Hardin County to the confluence of Big Sandy Creek and Kimball Creek in Hardin County (Figure 608.1).

Figure 608.1 –Village Creek Map



Background

The Village Creek watershed has many tributaries draining approximately 1,113 square miles as it flows southeasterly to it's confluence with the Neches River. LNVA routinely monitors six sites quarterly for Clean Rivers Program. TCEQ collects routine data quarterly and fish tissue semi-annually for one site on the mainstem. The Village Creek watershed lies entirely within the region of southeast Texas known as the Big Thicket. The U.S. Department of Interior/National Park Service maintains four preservation units in the watershed: Beech Creek Unit, Turkey Creek Unit, Big Sandy Unit and Hickory Creek Savannah Unit (visit http://www.nps.gov/bith/).

Previous assessments of the segment identified water quality concerns for fecal coliform bacteria, pH, and dissolved oxygen. Conclusions reached in the 1999 assessment report found correlation between the water quality concerns and streamflow. The pH levels tend to decrease as streamflow increased, while fecal coliform bacteria increased with an increase in streamflow. Low dissolved oxygen concentrations were correlated with low streamflow during the summer. Decreasing pH levels during increased streamflow indicates a flushing of backwater, swampy areas where decaying organic matter has depleted the oxygen content and tannic acids have lowered the pH levels.

Prior to the 1999 assessment, dissolved aluminum in water was identified as a possible concern. LNVA has since downgraded this to no concern based on a study by the United States Department of Agriculture, Natural Resource Conservation Service (NRCS) of aluminum in soil along the banks of Village Creek. Results of the NRCS report showed naturally occurring aluminum in the acidic soil; which produce conditions conducive to leaching aluminum into the stream.

Another related issue reported in the 1999 assessment was the Texas Department of Health (TDH) fish consumption advisory issued in April 1999. The advisory is still in affect for all fish species taken from Lake Kimball due to high levels of mercury in tissue. Mercury levels in fish tissue are bio-accumulated, becoming more concentrated as larger fish prey on smaller fish.

Assessment Results

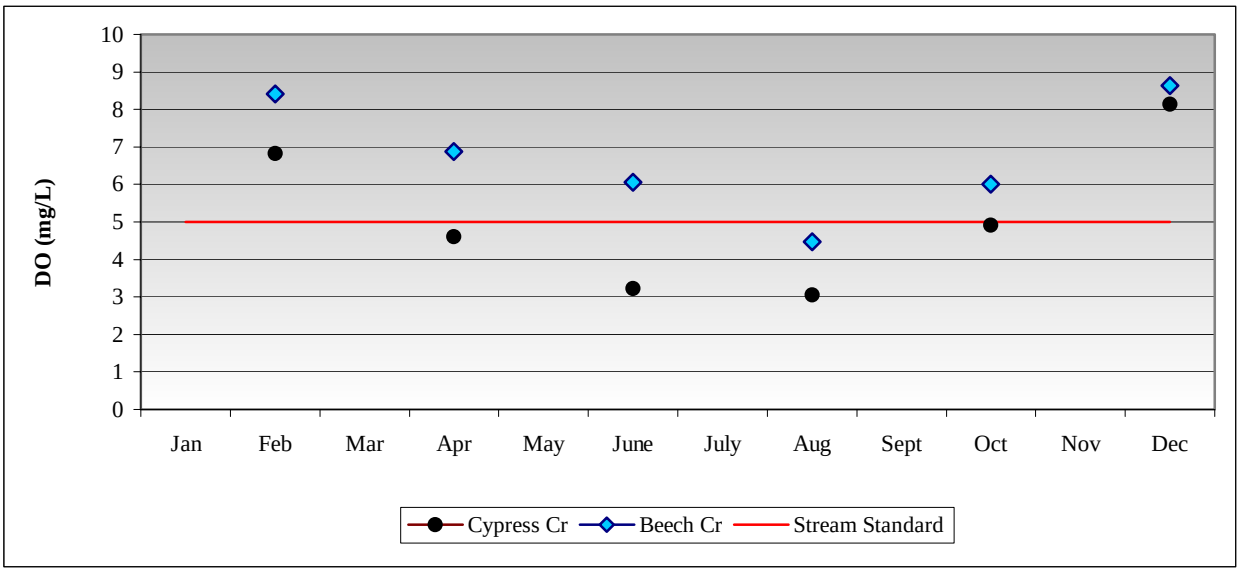
Segment 0608 is designated high aquatic life use, contact recreation and public water supply. Numeric criteria listed in the Texas Surface Water Quality Standards (TSWQS) and nutrient-screening levels can be found in Table 608.1 along with data analysis results. Metals in water screening levels are listed in Table 608.2.

The aquatic life use, as measured by dissolved oxygen (DO), is partially supported at Beech Creek at FM 1943 with levels failing to reach the 5 mg/L standard 21 % of the time. At Cypress Creek at US 69 the aquatic life use is not supported, with the stream failing to reach the DO standard 47% of the time.

The percent exceedances on both creeks are similar to those reported in the 1999 Basin Summary Report. Both creeks are highly stained, indicative of forest litter decay that not only lowers the pH but also exerts an oxygen demand on the waterbody lowering DO levels. These two tributaries to Village Creek are low gradient with dissolved oxygen levels subject to seasonal variance. Figure 608.2 illustrates the seasonal trend for the two water bodies.

Neither creek has permitted discharges influencing the routinely sampled sites. Beech Creek is probably the least disturbed water body in the segment; and where sampling occurs at FM 1943, the water has flowed through the Beech Creek Unit of the Big Thicket National Preserve. Cypress Creek does flow through areas upstream of US 69 where on site septic system are in place.

Figure 608.2-Seasonality of Dissolved Oxygen



Aquatic life use support levels are also determined by dissolved metals in water. Assessments are based on acute and chronic screening levels, which are calculated based on the hardness of the water sampled.

The acute criterion is fully supported when 10% or less of the data exceed the calculated criterion. Partial support occurs when greater than 10% to 25% of the data exceed the criterion and non-support is identified when greater than 25 % of the data exceed the criterion.

Table 608.1-Screening Results for Segment 0608

Segment 0608 -Village Creek	Aquatic Life Use			Contact Recreational Use	General Use Support Parameters					Nutrient Impact			
Station Id -Description	Dissolved Oxygen	Metals in Water	Organics in Water	Fecal Coliform	Temperature	pH	Chloride	Sulfate	Total Dissolved Solids	Nitrate + Nitrite (mg/L)	Ammonia-Nitrogen (mg/L)	Total Phosphate (mg/L)	Chlorophyll α (µg/L)
Screening level or Stream Criteria	≥ 5	See Table 608.2	Varies	≤ 400	≤ 32ºC (90ºF)	6.0-8.5	≤ 150	≤ 75	≤ 300	≤ 2.76	≤ 0.17	≤ 0.8	≤ 11.6
15353 - Big Sandy Ck. @ US 190	FS	NS	no data	NS	n/a	n/a	n/a	n/a	n/a	NC	NC	NC	no data
15356 - Turkey Ck. @ FM 1013	FS	FS	no data	NS	n/a	n/a	n/a	n/a	n/a	NC	NC	NC	no data
15355 - Beech Ck. @ FM 1943	PS	FS	no data	FS	n/a	n/a	n/a	n/a	n/a	NC	NC	NC	no data
15349 - Hickory Ck. @ US 69	FS	NS	no data	FS	n/a	n/a	n/a	n/a	n/a	NC	NC	NC	no data
13625 - Village Ck. @ FM 418	FS	NS	no data	FS	FS	PS	FS	FS	FS	NC	NC	NC	no data
10609 - Village Ck. @ US 96	FS	NS	no data	FS	FS	PS	FS	FS	FS	no data	NC	NC	NC
15352 - Cypress Ck. @ US 69	NS	NS	no data	FS	n/a	n/a	n/a	n/a	n/a	NC	NC	NC	no data

FS=Full Support, PS=Partial Support, NS=Not Supported, C = Concern, NC=No Concern, n/a=not applicable

Table 608.2-Metals Screening Levels for Segment 0608

Metal	*CRP_reporting limit*	*Acute screening level*	*Chronic screening level*
Aluminum	200	991	-
Arsenic	5.0	360	190
Cadmium	0.1	8.02	0.51
Cr (trivalent)	10.0	612.21	72.97
Copper	1.0	5.78	4.31
Lead	0.1	16.15	0.63
Nickel	10.0	483.11	53.71
Selenium	2.0	20	5
Silver	0.5	0.92	-
Zinc	5.0	39.80	36.05

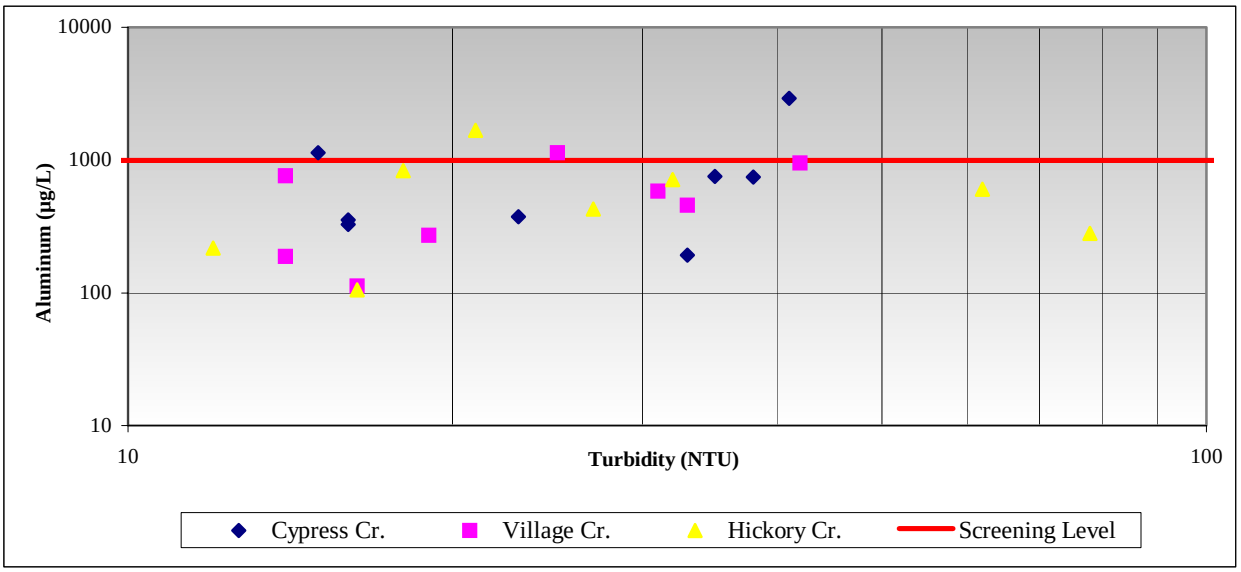
Chronic criteria for metals in water is fully supported when the average of the data set is less than or equal to the chronic criteria. Non-support of the chronic criteria is identified when the average of the data set is greater than the chronic criteria. Partial support is not assessed for chronic criteria.

Data screening results indicate partial or non-support of the aquatic life use for the following metals in water:

- Aluminum (acute) – Partially supported at Hickory Cr. at US 69, Village Cr. at FM 418 and Cypress Cr. at US 69.
- Cadmium (chronic) – Not supported at Big Sandy Cr. at US 190 and Cypress Cr. at US 69.
- Lead (chronic) – Not supported Cypress Cr. at US 69.

Natural sources of aluminum can be found in the clayey substrate prevalent in the region. With low pH waters, leaching of aluminum from clay is a natural pathway into the water column. Figure 608.3 illustrates the aluminum concentration exist in the water column when both low and high turbid levels are prevalent. This may indicate that aluminum is leaching from the acidic soils into the stream, without being transported by the suspended sediment load.

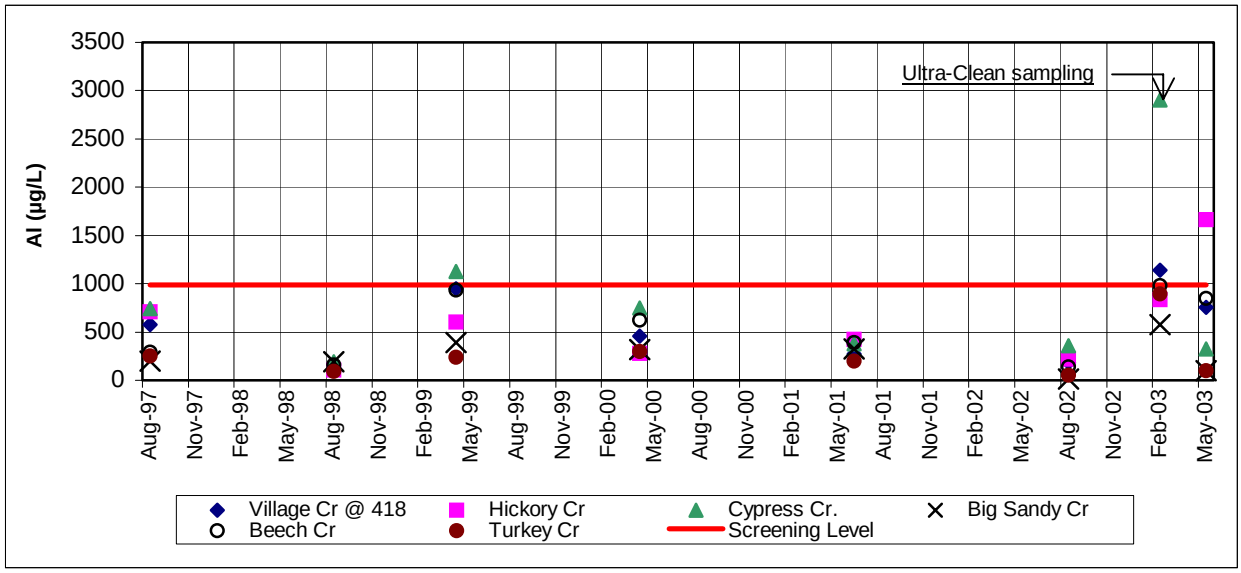
Figure 608.3-Aluminum vs Turbidity Plot



Since late 2002, LNVA has employed an ultra-clean sampling and analysis technique to achieve the lower reporting limits for metals required by the CRP. LNVA is investigating the occurrence of elevated aluminum by splitting samples between laboratories to verify results beginning spring 2004.

Figure 608.4 depicts the historical concentrations of aluminum in water throughout the segment. Since LNVA employed the ultra-clean sample collection and analysis technique in 2002, increased aluminum values have been detected.

Figure 608.4-Historical Aluminum Levels



Natural sources of cadmium and lead are not as easily identified in Southeast Texas. Manmade products containing these metals are listed below. Correlations were not found to identify specific conditions, which reveal a relationship to the occurrence of high concentrations of these metals.

Cadmium	**Lead**
Batteries	Paint chips/dust
Stabilizer for PVC	from buildings, bridges
Pigments in plastics and paint	and other metal structures
Electroplating	Industrial emissions

In the summer of 2002 LNVA started using an ultra-clean metals sampling technique to achieve lower detection limits for reporting results required by the Clean Rivers Program. Levels of cadmium decreased, while lead concentrations increased, after the new technique was implemented. Results obtained prior to the ultra-clean technique were reported as non-detections (or less than values) but the level of detection was still higher than the screening levels for many metals. For assessment purposes non-detects are assessed as one half of the non-detect value or one half of the screening criteria, which ever is less. Average concentrations, as compared to the chronic aquatic life use criterion, of both cadmium and lead in the watershed can be found in Figures 608.5 and 608.6, respectively.

Figure 608.5 below illustrates the watershed trend of average cadmium concentrations compared to the chronic criterion. Average cadmium concentration for Cypress Creek is 2.5 times greater than the chronic criterion.

Figure 608.5-Average Cadmium Levels

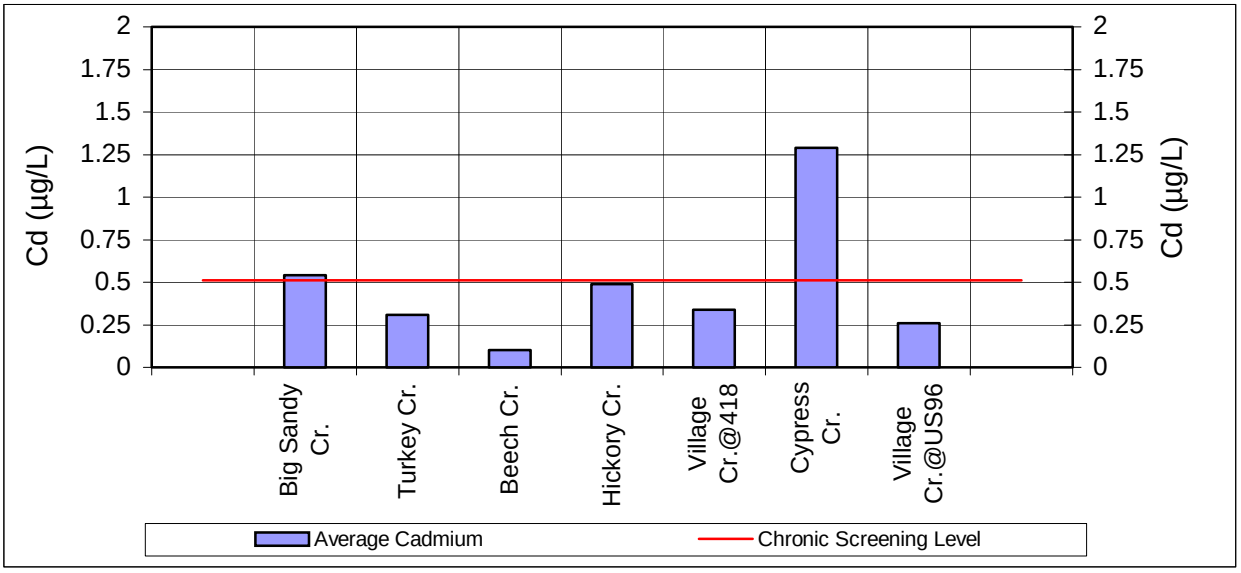
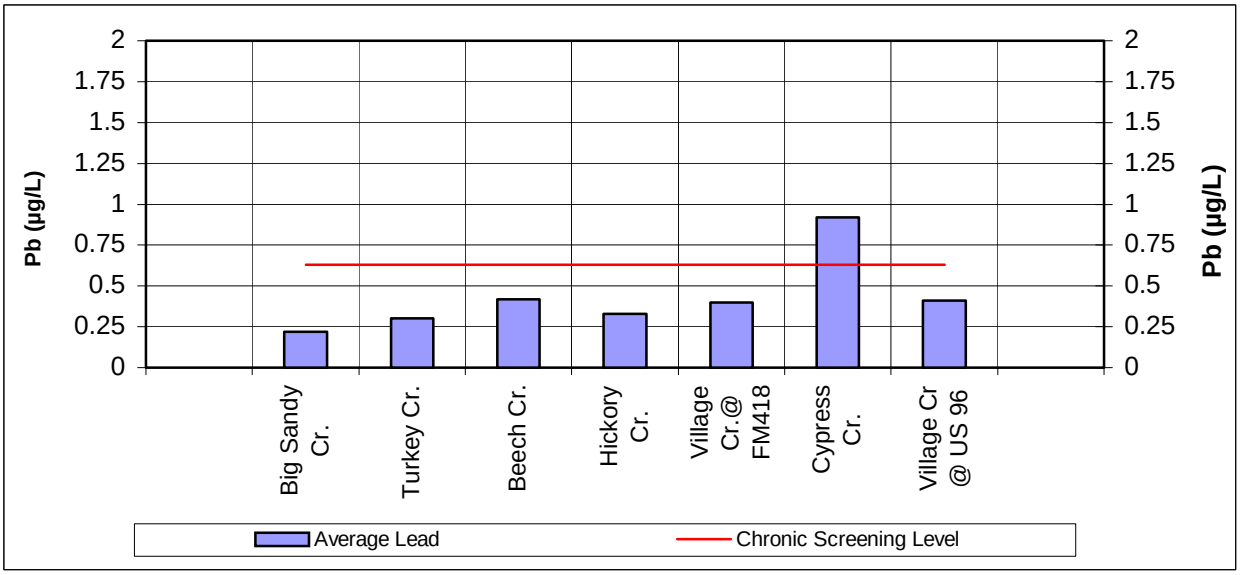


Figure 608.6 illustrates the average lead concentrations in the watershed. Once the ultra-clean sampling and analysis technique was implemented, higher levels of lead were detected, similar to the results for aluminum.

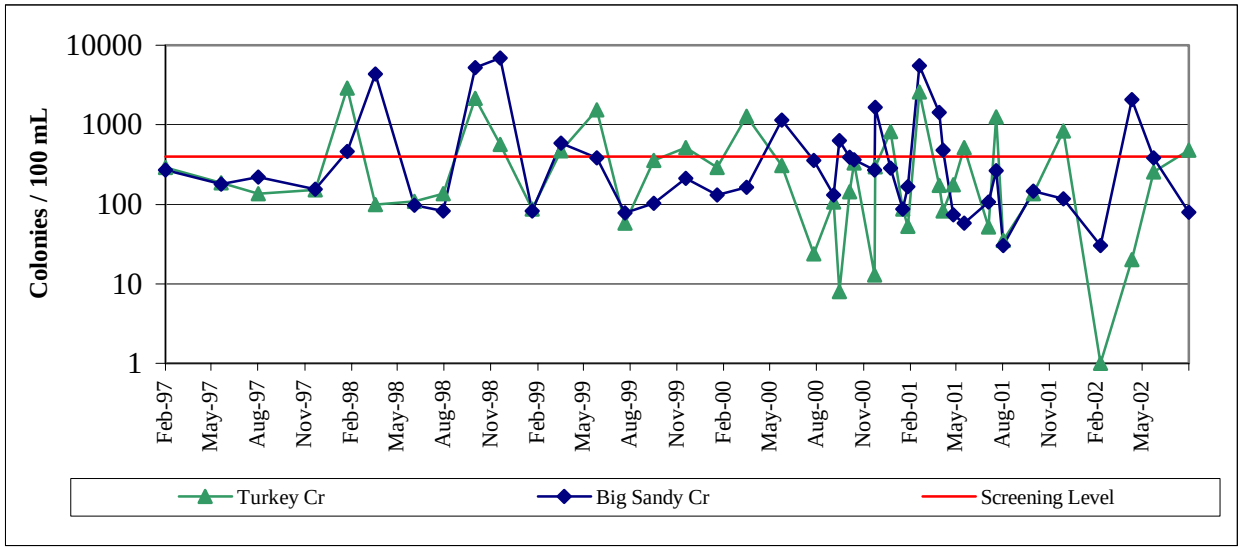
Figure 608.6-Average Lead Levels



LNVA, by cooperating with TCEQ through the Clean Rivers Program, was able to secure funds for additional routine sampling of metals in water.

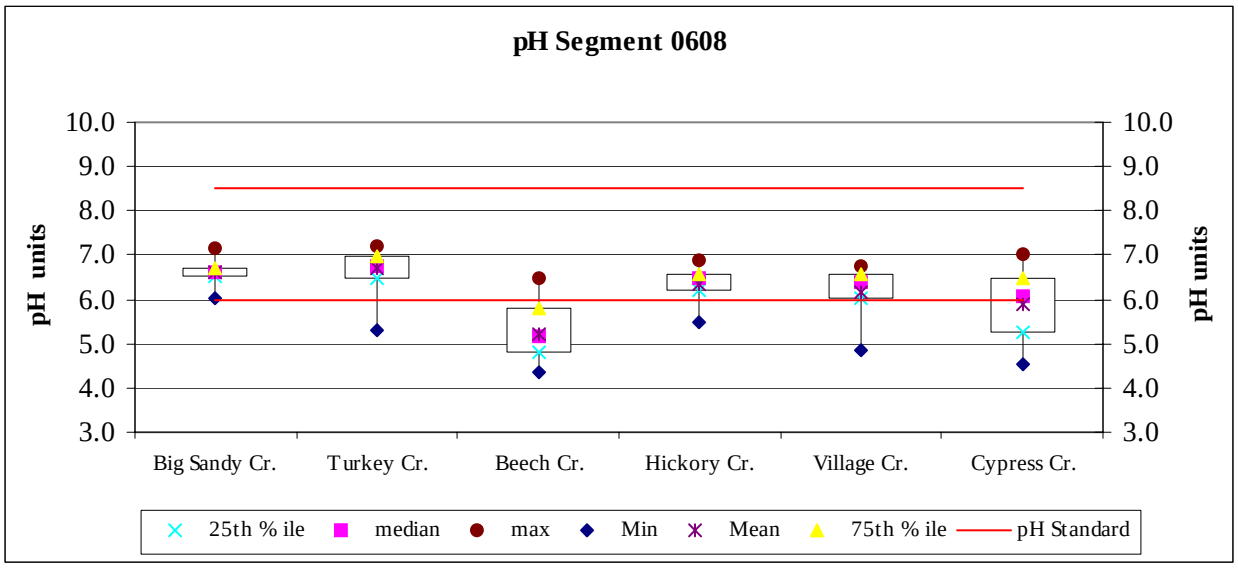
Data screening also revealed the contact recreational use, as measured by fecal coliform, is not supported at Big Sandy Creek @ US 190 and Turkey Creek @ FM 1013. Samples exceeded the 400 colonies per 100 mL screening level 26% and 30% of the time, respectively. No specific factors, such as flow or season, could be correlated with elevated bacteria; however, temporal plots indicate exceedances of bacteria levels are not as high since May 2001 (Figure 608.7).

Figure 608.7-Fecal Coliform Trend



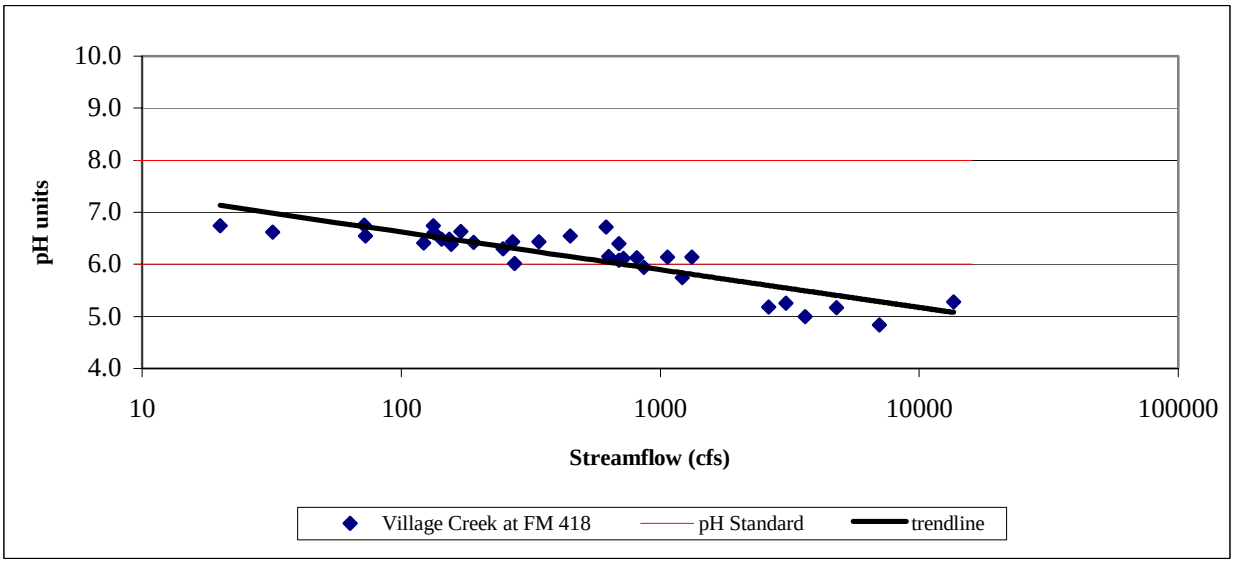
The general use criterion for pH is partially supported on Village Creek at FM 418 and Village Creek at US 96. The average pH of Village Creek and its tributaries monitored range between 5.2 and 6.7 pH units. Figure 608.8 also illustrates that pH levels in Beech Creek and Cypress Creek are consistently low, impacting the pH on Village Creek. General use support only applies to the defined stream segment. Therefore, a non-support for pH is not identified for the tributaries.

Figure 608.8-pH range in Segment 0608



As reported in previous assessments, an inverse relationship exists between pH and streamflow. When streamflows increase the pH will decrease, as depicted in Figure 608.9. This may indicate a flushing of backwater, swampy areas where organic decay of forest litter lowers the pH, impacting the stream.

Figure 608.9-pH vs Streamflow Plot



Recommendations

The cause of impairments identified in the Village Creek watershed can be attributed to either natural conditions or non-point source pollution.

Beech Creek and Cypress Creek do not meet the dissolved oxygen criterion. Natural conditions such as low gradient streams, decaying organic matter, during the warmer, low flow summer months affect the streams DO. Dissolved oxygen criterion specific to these streams is needed to insure appropriate aquatic life use standards are applied. LNVA will consult with the TCEQ concerning this issue.

The natural conditions listed above are also affecting the low pH in Village Creek. Beech and Cypress Creeks empty into Village Creek upstream of routine sampling sites. The highly stained, low pH characteristics of the tributaries impact Village Creek. LNVA will recommend that TCEQ to review the current pH stream standard range to determine if it is appropriate for the segment.

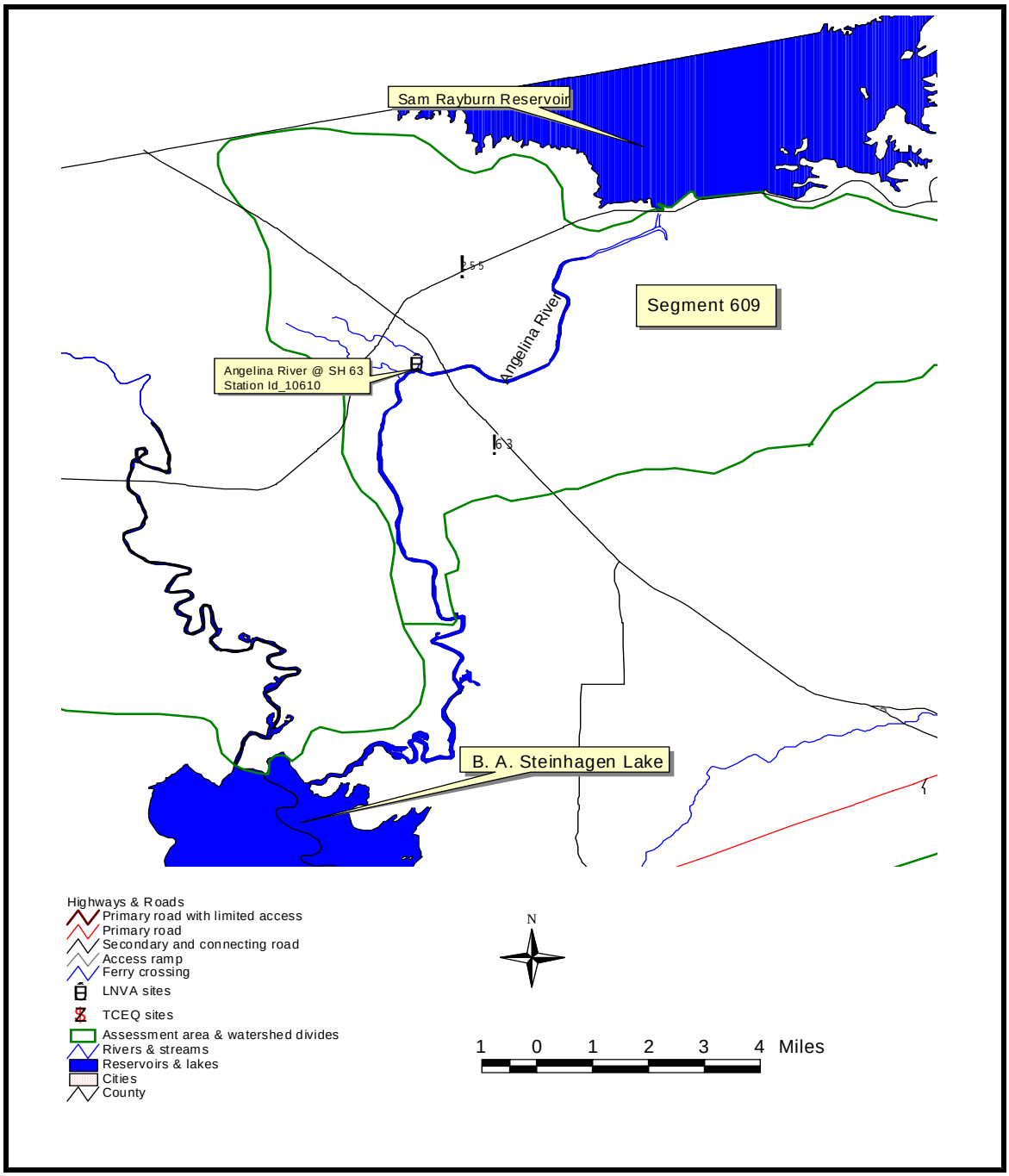
Non-support of the contact recreational use due to elevated bacteria levels on Turkey and Big Sandy Creeks may be non-point related. LNVA will seek input from the steering committee on whether to sample these sites for contact recreation standards compliance. This sampling effort will require additional funding.

LNVA is working with TCEQ to secure funds for additional metals sampling to determine if non-support of aquatic life use persists. LNVA will also split metals samples between laboratories to verify high aluminum values.

Segment 0609 – Angelina River below Sam Rayburn Reservoir

As defined by the Texas Surface Water Quality Standards, Segment 0609 is from a point immediately upstream of it's confluence of Indian Creek in Jasper County to Sam Rayburn Dam in Jasper County. The segment extends 20 river miles from the tailrace below Sam Rayburn Dam towards the headwaters of B. A. Steinhagen Lake. LNVA monitors one site (10610) on the segment.

Figure 609.1 – Angelina River below Sam Rayburn Reservoir Map



Background

Segment 0609 lies within Jasper County approximately ten miles northwest of the City of Jasper. The segment extends twenty river miles from the tailrace below Sam Rayburn Dam towards the headwaters of B.A. Steinhagen Reservoir. Another 5.2 miles of old riverbed exists along the lower side of Sam Rayburn Dam upstream from the confluence with the tailrace. The drainage area of Segment 0609 is 107 square miles, with landuse characterized as sparsely populated and heavily forested with minimal area of non-irrigated cropland located in the southeast quadrant of the watershed.

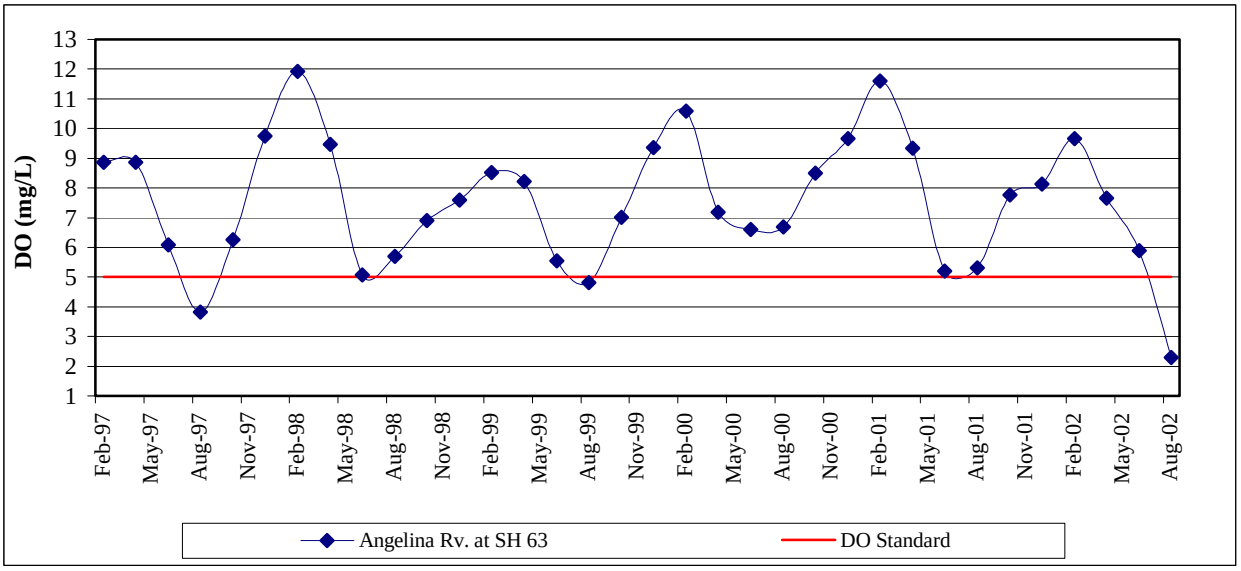
Assessment Results

Segment 0609 is designated contact recreation, high aquatic life and public water supply uses. Numeric criteria listed in the Texas Surface Water Quality Standards (TSWQS) and nutrient-screening levels can be found in Table 609.1 along with data analysis results. Metals screening levels are listed in Table 609.2, below.

Overall the water quality of Segment 0609 is good. The contact recreational use is fully supported for the segment. Aquatic life use, as measured by dissolved oxygen and metals in water is fully supported. The general use criteria are fully supported for the following suite of parameters: pH, temperature, chloride, sulfate and total dissolved solids. There are no concerns due to nutrients. Chlorophyll was not collected at this site.

Historical assessments identified partial support for low dissolved oxygen levels due to hypolimnetic (bottom layer of cold water low in oxygen in a stratified lake) releases from Sam Rayburn Reservoir. Current screening results show only 9% of 34 measurements were less than the 5 mg/L DO stream standard. Figure 609.2 depicts the temporal trend of dissolved oxygen.

Figure 609.2-Dissolved Oxygen Trend



The graph above shows dissolved oxygen concentrations peak during winter months and lower concentrations occur during summer months when the reservoir is stratified. During summer lake stratification, colder water sinks to the bottom while the warmer waters rise to the surface. At this time circulation is limited to the upper lake level, and the colder water near the bottom is depleted of oxygen. The situation is reversed during the winter when the entire water column is at or near the same temperature, therefore allowing full circulation and replenishment of oxygen.

Recommendation

LNVA will continue routine monitoring the only site on the segment to maintain baseline water quality database, ensuring stream standards and nutrient levels are met.

Table 609.1-Screening Results for Segment 0609

Segment 0609 - Angelina River below Sam Rayburn Reservoir	Aquatic Life Use			Contact Recreational Use	General Use Support Parameters					Nutrient Impact			
Station Id -Description	Dissolved Oxygen	Metals in Water	Organics in Water	Fecal Coliform	Temperature	pH	Chloride	Sulfate	Total Dissolved Solids	Nitrate + Nitrite (mg/L)	Ammonia-Nitrogen (mg/L)	Total Phosphate (mg/L)	Chlorophyll α (µg/L)
Screening level or Stream Criteria	≥ 5	See Table 609.2	Varies	≤ 400	≤ 32ºC (90ºF)	6.0-8.5	≤ 70	≤ 50	≤ 250	≤ 2.76	≤ 0.17	≤ 0.8	≤ 11.6
10610 - Angelina River @ US 63	FS	FS	no data	FS	FS	FS	FS	FS	FS	NC	NC	NC	no data

FS=Full Support, PS=Partial Support, NS=Not Supported, C = Concern, NC=No Concern, n/a=not applicable

Table 609.2-Metals Screening Levels for Segment 0609

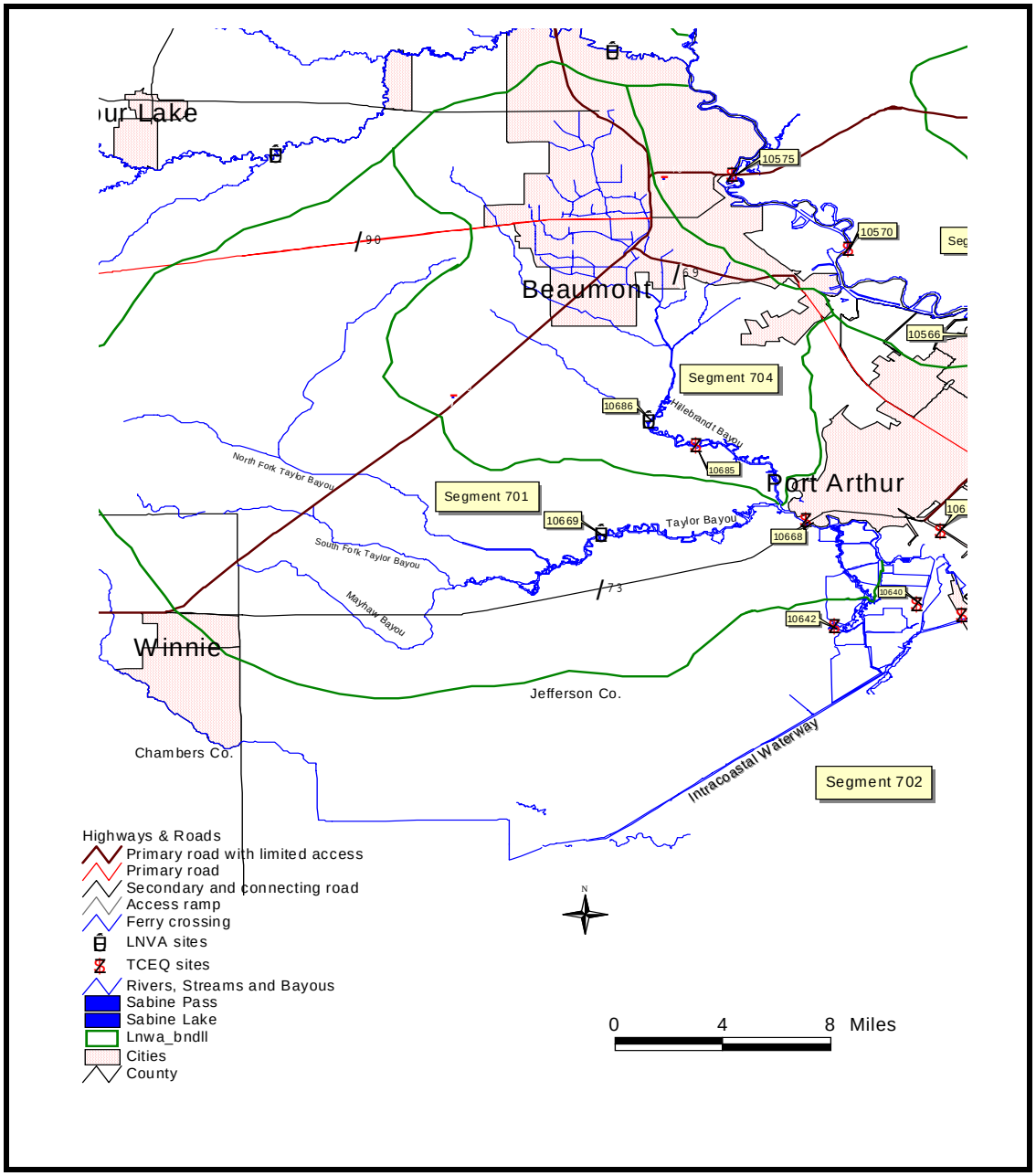
Metal	*CRP_reporting limit*	*Acute screening level*	*Chronic screening level*
Aluminum	200	991	-
Arsenic	5.0	360	190
Cadmium	0.1	8.02	0.51
Cr (trivalent)	10.0	612.21	72.97
Copper	1.0	5.78	4.31
Lead	0.1	16.15	0.63
Nickel	10.0	483.11	53.71
Selenium	2.0	20	5
Silver	0.5	0.92	-
Zinc	5.0	39.80	36.05

Segment 0701 – Taylor Bayou above Tidal

As defined in the Texas Surface Water Quality Standards, Segment 0701 is from the salt water lock 7.7 kilometers (4.8 miles) downstream of SH 73 in Jefferson County to the Lower Neches Valley Authority Canal in Jefferson County. Taylor Bayou is a deep stream ranging from 8 feet to 13 feet in depth with characteristic low gradient and sluggish flow. A saltwater lock near the mouth of the bayou minimizes tidal impact and saltwater intrusion.

Two sites are routinely monitored quarterly by LNVA and TCEQ for field parameters, conventional lab parameters, flow, bacteria and metals in water, see Figure 701.1.

Figure 701.1 – Taylor Bayou above Tidal Map



Background

The segment is 33 miles long and designated for contact recreation and intermediate aquatic life use. Irrigation return flows from rice fields, storm water runoff and municipal and industrial discharge are the principle sources of flow in the segment and its major tributary, Hillebrandt Bayou.

With the exception of dissolved oxygen impairment, this segment was healthy and free of contamination indicators reported in the 2001 assessment.

***A**ssessment Results*

Segment 0701 numeric criteria listed in the Texas Surface Water Quality Standards (TSWQS) and nutrient screening levels can be found in Table 701.1 along with data analysis results. Metals screening levels are listed in Table 701.2.

The general use criteria, as measured by pH, water temperature, chloride, sulfate and total dissolved solids, are fully supported in the segment.

Table 701.1-Screening Results for Segment 0701

Segment 0701 - Taylor Bayou above Tidal	Aquatic Life Use			Contact Recreational Use	General Use Support Parameters					Nutrient Impact			
Station Id -Description	Dissolved Oxygen	Metals in Water	Organics in Water	Fecal Coliform	Temperature	pH	Chloride	Sulfate	Total Dissolved Solids	Nitrate + Nitrite (mg/L)	Ammonia-Nitrogen (mg/L)	Total Phosphate (mg/L)	Chlorophyll α (µg/L)
Screening level or Stream Criteria	≥ 4	See Table 701.2	Varies	≤ 400	≤ 35ºC (95ºF)	6.0-9.0	≤ 400	≤ 100	≤ 1,100	≤ 2.76	≤ 0.17	≤ 0.8	≤ 11.6
10668 - Taylor Bayou @ SH 73	PS	no data	no data	FS	FS	FS	FS	FS	no data	no data	NC	NC	C
10669 - Taylor Bayou @ LaBelle Rd	PS	NS	no data	FS	FS	FS	FS	FS	FS	NC	NC	NC	no data

FS=Full Support, PS=Partial Support, NS=Not Supported, C = Concern, NC=No Concern, n/a=not applicable

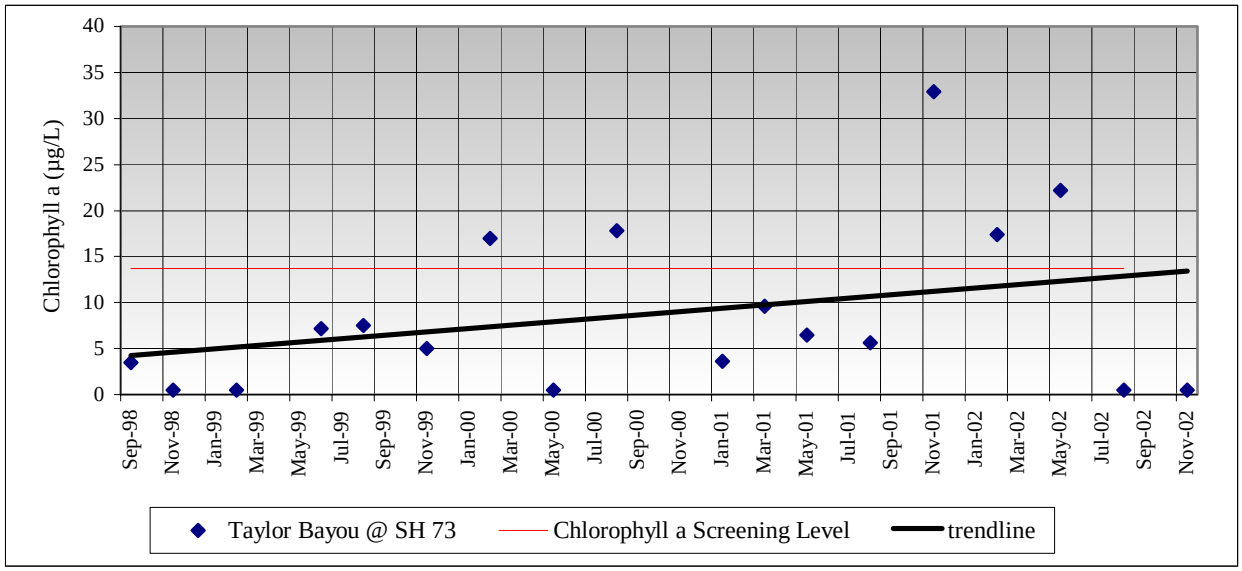
Table 701.2-Metals Screening Levels for Segment 0701

Metal	*CRP_reporting limit*	*Acute screening level*	*Chronic screening level*
Aluminum	200	991	-
Arsenic	5.0	360	190
Cadmium	0.1	18.9	0.8
Cr (trivalent)	10.0	1142.8	136.2
Copper	1.0	11.9	8.3
Lead	0.1	42.6	1.7
Nickel	10.0	920.6	102.3
Selenium	2.0	20.0	5.0
Silver	0.5	0.9	-
Zinc	5.0	75.9	68.8

Contact recreational use, as measured by fecal coliform bacteria, is fully supported.

Concerns were identified in the segment related to nutrients. Chlorophyll was identified as a concern (> 25% of the data exceed screening level criterion) for Taylor Bayou at SH 73. Of 18 samples collected, 28% exceeded the 13.7µg/L screening level, with an average concentration of 8.8 µg/L. Chlorophyll is the green pigment present in all plant life necessary for photosynthesis. Figure 701.2 is a temporal trend of chlorophyll at this site.

Figure 701.2-Chlorophyll Trend



The graph above depicts an increasing temporal trend of chlorophyll concentrations on Taylor Bayou at SH 73.

Nutrients collected at both the SH 73 site and at LaBelle Road were checked against the elevated chlorophyll levels at SH 73, but neither yielded obvious correlation, see Figures 701.3 and 701.4. Nutrients like nitrogen and phosphorous can act as fertilizing compounds and stimulate the growth of algae and other aquatic plants.

Figure 701.3-Chlorophyll vs NH3 Plot

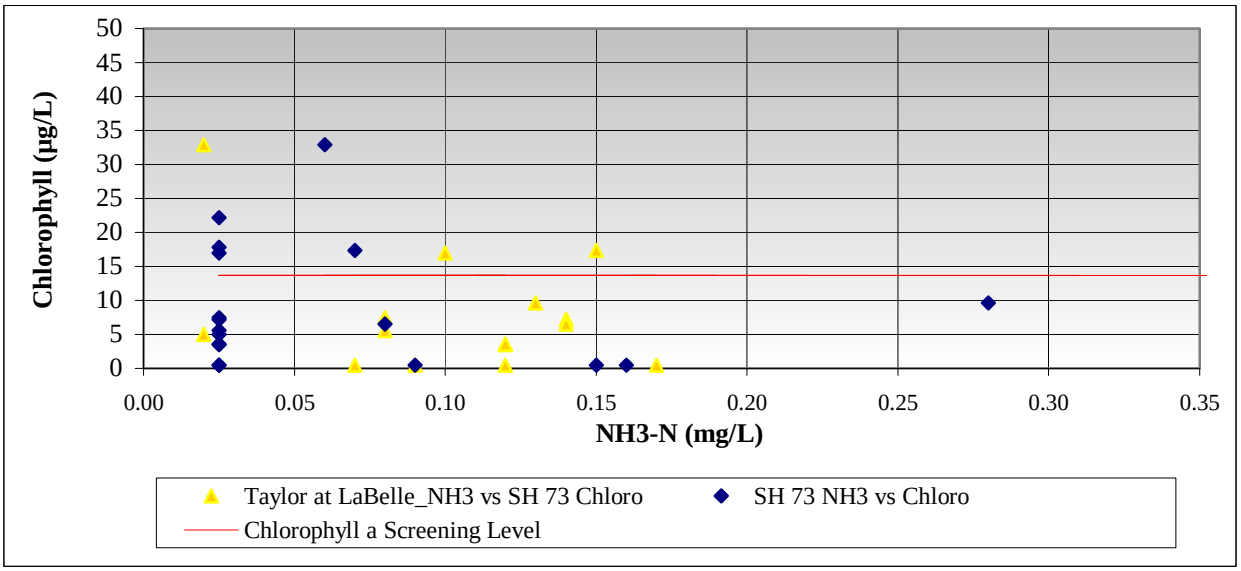


Figure 701.3 is a plot of chlorophyll values and ammonia. Taylor Bayou at LaBelle Rd. is located upstream of SH 73. The high chlorophyll levels observed when ammonia-nitrogen (NH3-N) concentrations are low may indicate uptake of the nutrient for algal production. Its inclusion on this graph was to resolve whether nutrients measured upstream are impacting downstream chlorophyll concentrations.

Figure 701.4-Chlorophyll vs Total Phosphate Plot

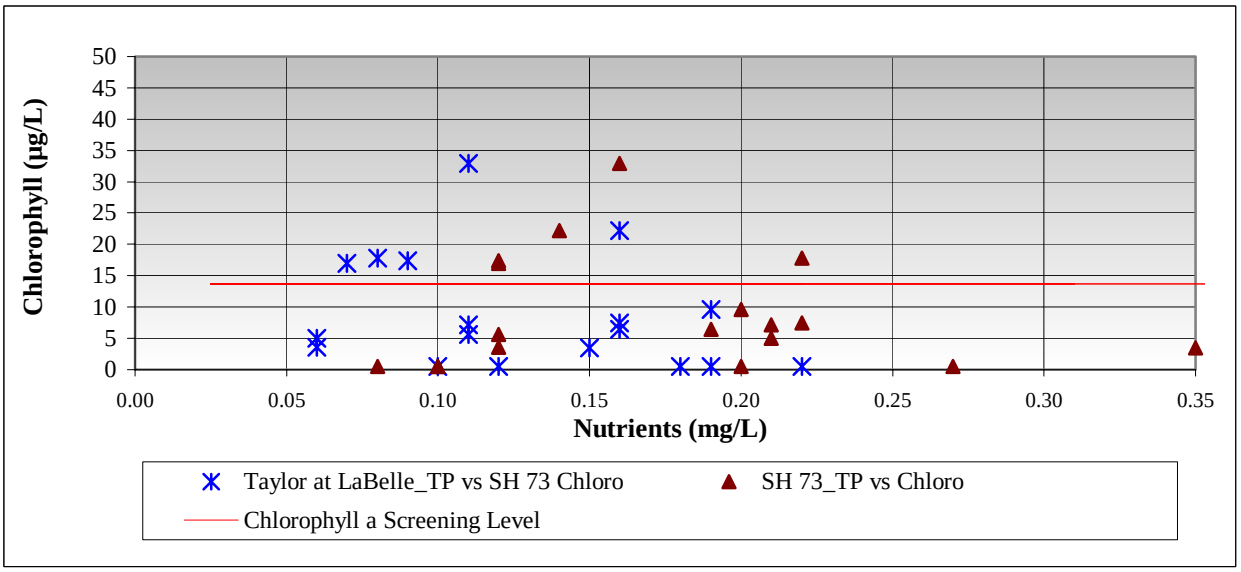
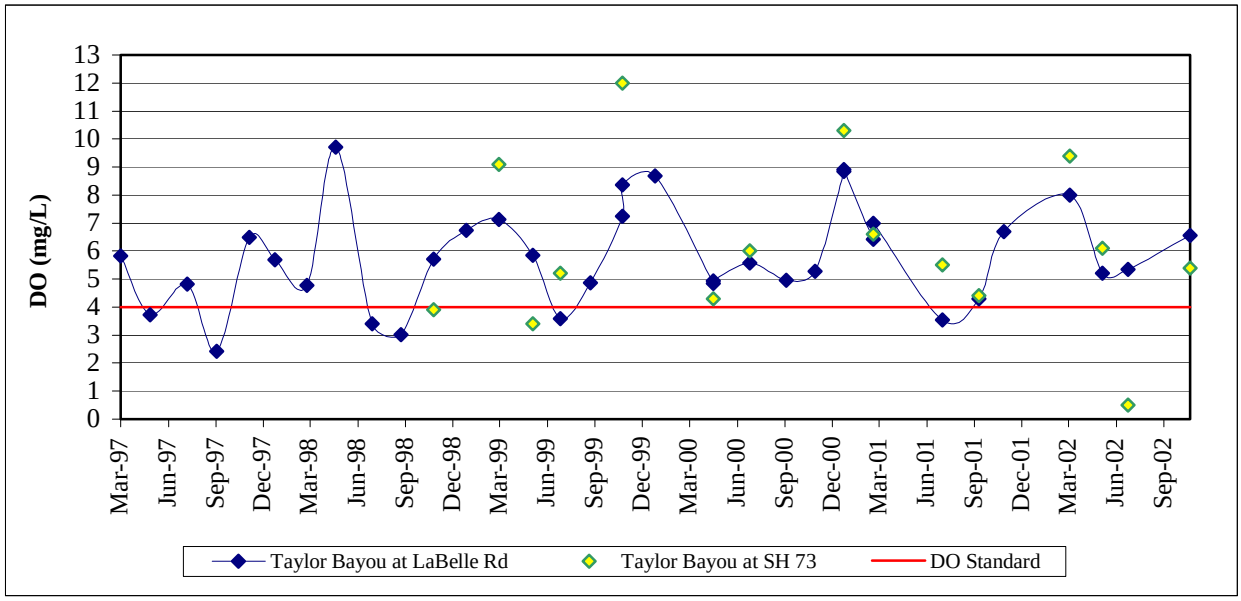


Figure 701.4 is a plot of chlorophyll values and total phosphate. The presence of high phosphate levels and high chlorophyll at the SH 73 site may indicate that phosphate is not limiting algal growth. The presence of low phosphorus concentrations at the LaBelle Road site and high chlorophyll downstream may indicate phosphate consumption to yield algal blooms.

The aquatic life use in the segment, as measured by dissolved oxygen (DO), is partially supported (11% - 25% of the data are less than the DO criterion). The DO levels were found to be less than the standard criterion of 4.0 mg/L for Taylor Bayou at SH 73 (Station Id_10668) 19% of the time. Dissolved oxygen levels were less than the standard criterion 17% of the time at LaBelle Road (Station Id_10669). Figure 701.5 is a temporal plot of dissolved oxygen (DO) for both monitoring sites.

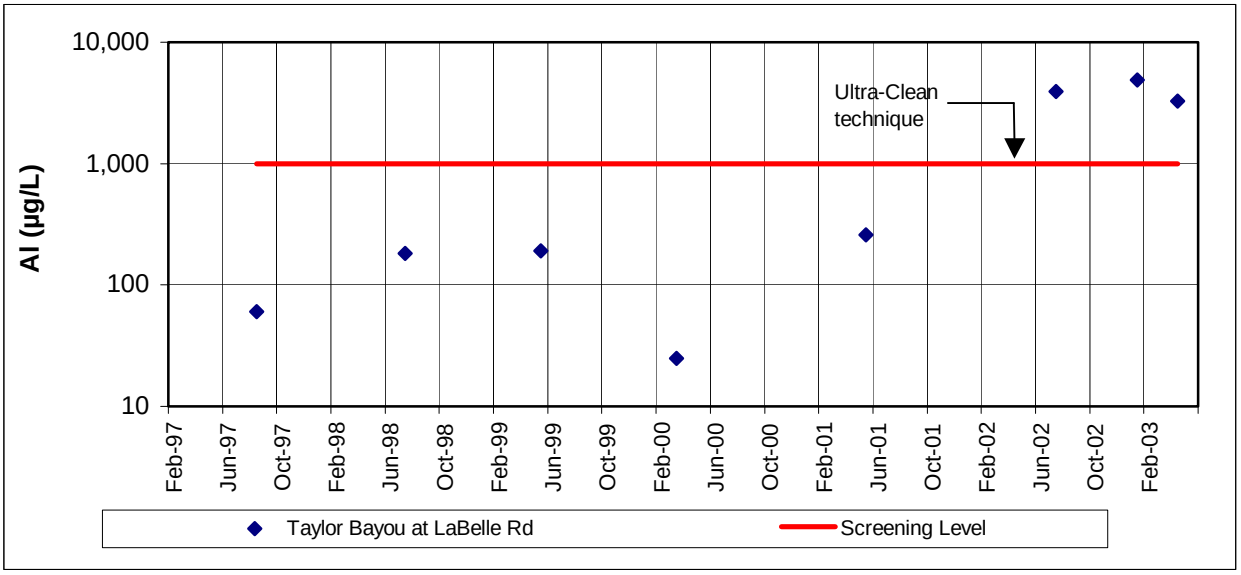
Figure 701.5-Dissolved Oxygen Trend



The graph above indicates a seasonal trend of DO, where oxygen levels are less than the standard during the warm summer months.

Aquatic life use is also assessed by metals in water. Screening results of metals in water indicate non support of aquatic life use for aluminum (acute) for Taylor Bayou at LaBelle Road (Station Id_10669). Figure 701.6 is a temporal trend of aluminum data collected. As noticed at other sites, aluminum concentrations have increased since LNVA began using the ulta-clean sample collection and analysis technique in April 2002.

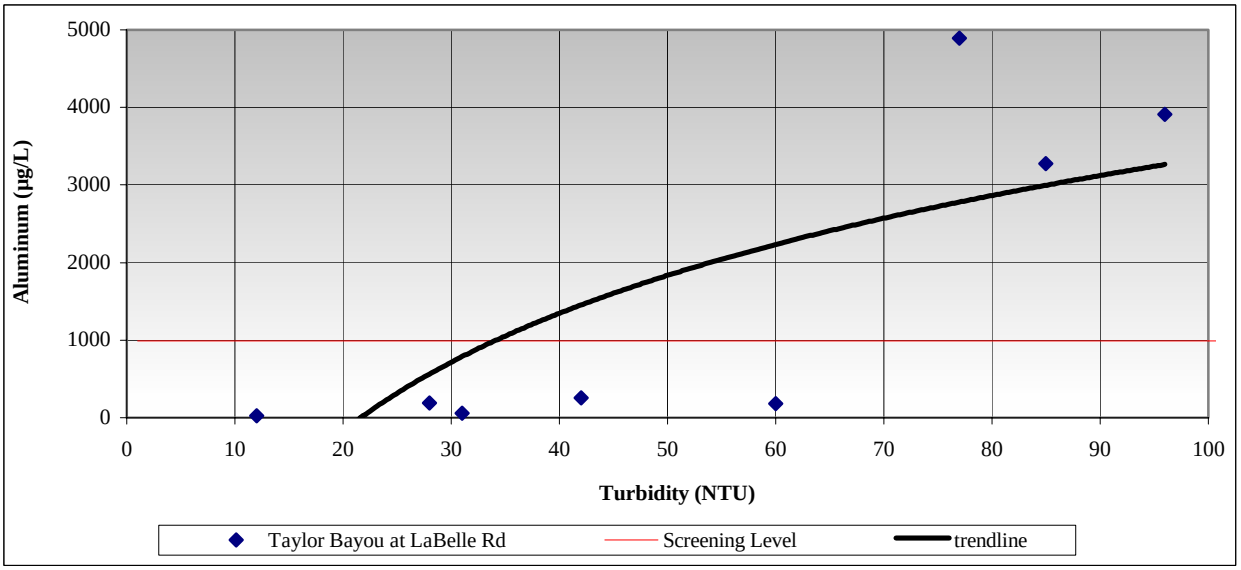
Figure 701.6-Historical Aluminum Levels



LNVA is investigating the occurrence of elevated aluminum by splitting samples between laboratories to verify results.

Natural sources of aluminum can be found in the clay substrate from the headwaters to the mouth throughout the watershed, seeFigure 701.7

Figure 701.7-Aluminum vs Turbidity Plot



The graph above illustrates the correlation between the aluminum content to the amount of turbidity (or suspended solids) in the water column.

Recommendations

Taylor Bayou drains approximately 530 square miles and is characterized by sluggish flows due to its low gradient.

Low dissolved oxygen in the bayou is not uncommon. Compared to previous assessments, the current partial support of DO identified is an improvement from the non-support reported the 2001 assessment. LNVA will continue to monitor the segment and analyze new data.

LNVA is working with TCEQ to secure funds for more sampling of metals in water to determine their source(s). LNVA is also researching the high aluminum concentration detected and will split samples between laboratories to verify results.

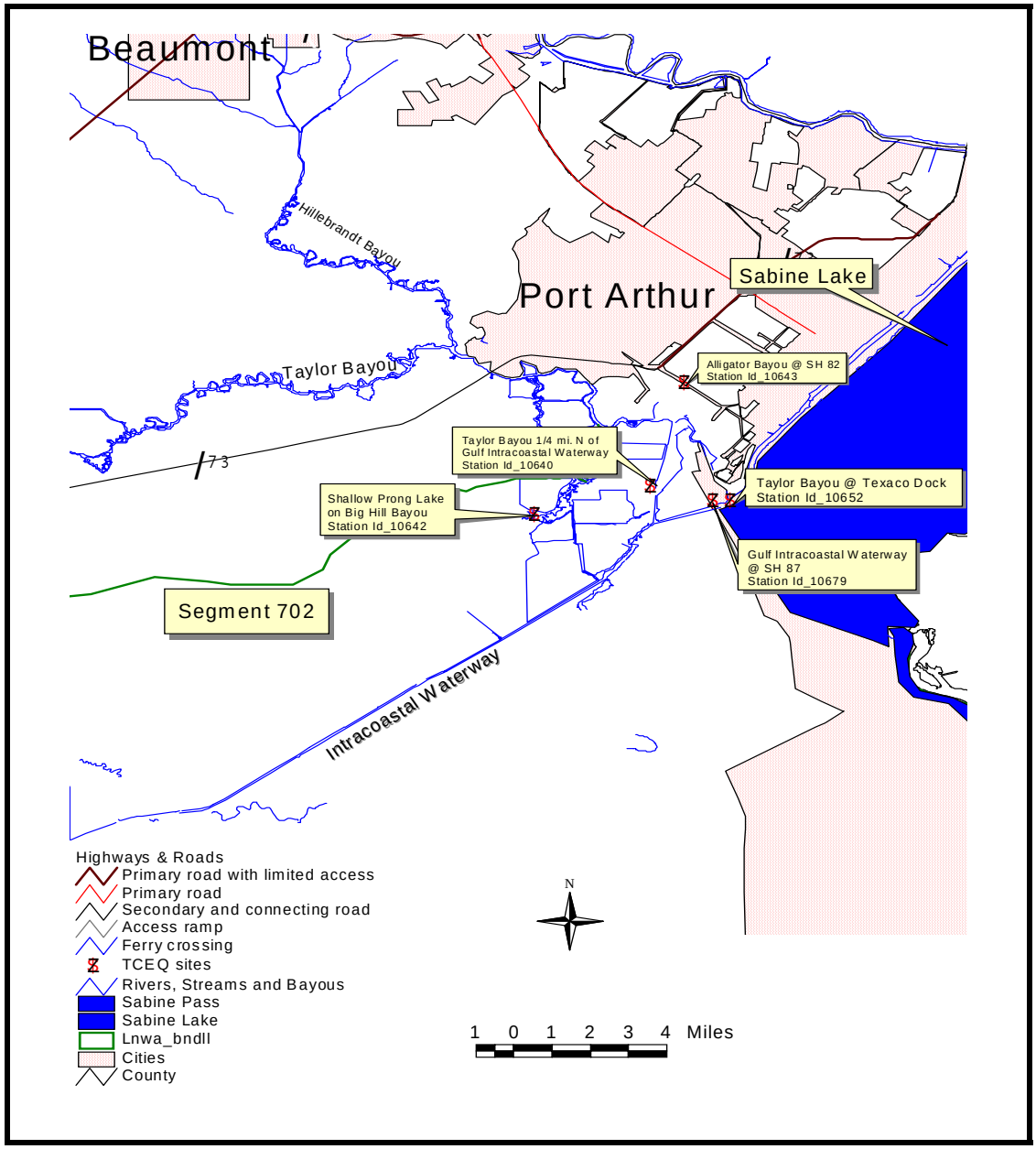
The chlorophyll *a* concern will be closely followed and LNVA will continue to examine the data for any trend development. As part of the ongoing monitoring coordination LNVA will work with TCEQ Region 10 to develop a monitoring strategy that may shed light on the concern.

Segment 0702 – Intracoastal Waterway Tidal

As defined in the Texas Surface Water Quality Standards, Segment 0702 is from the confluence with Galveston Bay at Port Bolivar in Galveston County to the confluence with the Sabine-Neches Canal in Jefferson County (including Taylor Bayou Tidal from the confluence with the Intracoastal Waterway up to the salt water lock 7.7 kilometers (4.8 miles) downstream of SH 73 in Jefferson County).

Five sites are routinely monitored quarterly by TCEQ for field parameters, conventional lab parameters, flow, bacteria and metals in water, see Figure 702.1.

Figure 702.1 – Intracoastal Waterway Tidal Map



Background

The segment is 63 miles long, traversing southern Jefferson County and a small portion of Chambers County. The eastern reach of the segment receives discharges from 31 permitted outfalls, 24 industrial and 7 domestic

Results reported in the 2001 assessment indicated that at all sites monitored in the segment fully supported its designated uses, as well as the general use criteria. There were no concerns identified for nutrients or chlorophyll.

Assessment Results

Segment 0702 is designated contact recreation and high aquatic life use. Numeric criteria listed in the Texas Surface Water Quality Standards (TSWQS) and nutrient-screening levels can be found in Table 702.1 along with data analysis results. Metals screening levels are listed in Table 702.2, below.

The general use criteria are fully supported for pH and water temperature. Standards for chloride, sulfate and total dissolved solids are not applicable to tidal segments.

Non support of the aquatic life use (> 25% of samples) due to low dissolved oxygen levels were found Shallow Prong Lake on Big Hill Bayou (Station Id_10642). The waterbody is a shallow marsh lake receiving little water exchange with the surrounding environment and no direct discharges into the system. Of the 11 samples available for analysis, 45% were less than the 4.0 mg/L standard. Oxygen levels ranged from 1.0 mg/L to 9.2 mg/L and are considered to naturally fluctuate due to seasonal conditions, see Figure 0702.2 below.

Figure 702.2-DO in Shallow Prong Lake

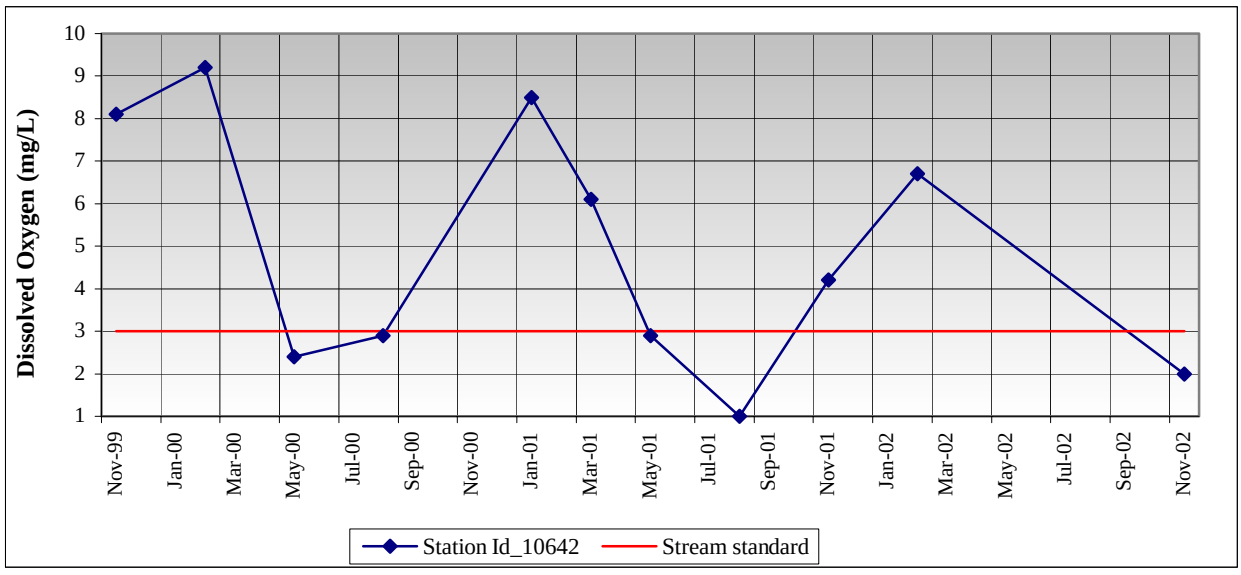


Table 702.1-Screening Results for Segment 0702

Segment 0702 - Intracoastal Waterway Tidal	Aquatic Life Use			Contact Recreational Use	General Use Support Parameters					Nutrient Impact			
Station Id -Description	Dissolved Oxygen	Metals in Water	Organics in Water	Fecal Coliform	Temperature	pH	Chloride	Sulfate	Total Dissolved Solids	Nitrate + Nitrite (mg/L)	Ammonia-Nitrogen (mg/L)	Total Phosphate (mg/L)	Chlorophyll α (µg/L)
Screening level or Stream Criteria	≥ 4	See Table 609.2	Varies	≤ 400	≤ 32ºC (90ºF)	6.0-8.5	≤ 70	≤ 50	≤ 250	≤ 0.26	≤ 0.17	≤ 0.8	≤ 11.6
10679 - Gulf Intracoastal Waterway (GIWW) @ SH 87	FS	no data	no data	FS	FS	FS	n/a	n/a	n/a	no data	NC	NC	NC
10640 - Taylor Bayou 1/4 mile North of GIWW	FS	no data	no data	FS	FS	FS	n/a	n/a	n/a	no data	C	NC	C
10652 - Taylor Bayou @ Texaco dock	FS	no data	no data	FS	FS	FS	n/a	n/a	n/a	no data	NC	NC	NC
10643 - Alligator Bayou @ SH 82	FS	FS	no data	FS	n/a	n/a	n/a	n/a	n/a	no data	NC	NC	C
10642 - Shallow Prong Lake on Big Hill Bayou	NS	no data	no data	FS	n/a	n/a	n/a	n/a	n/a	no data	NC	NC	NC

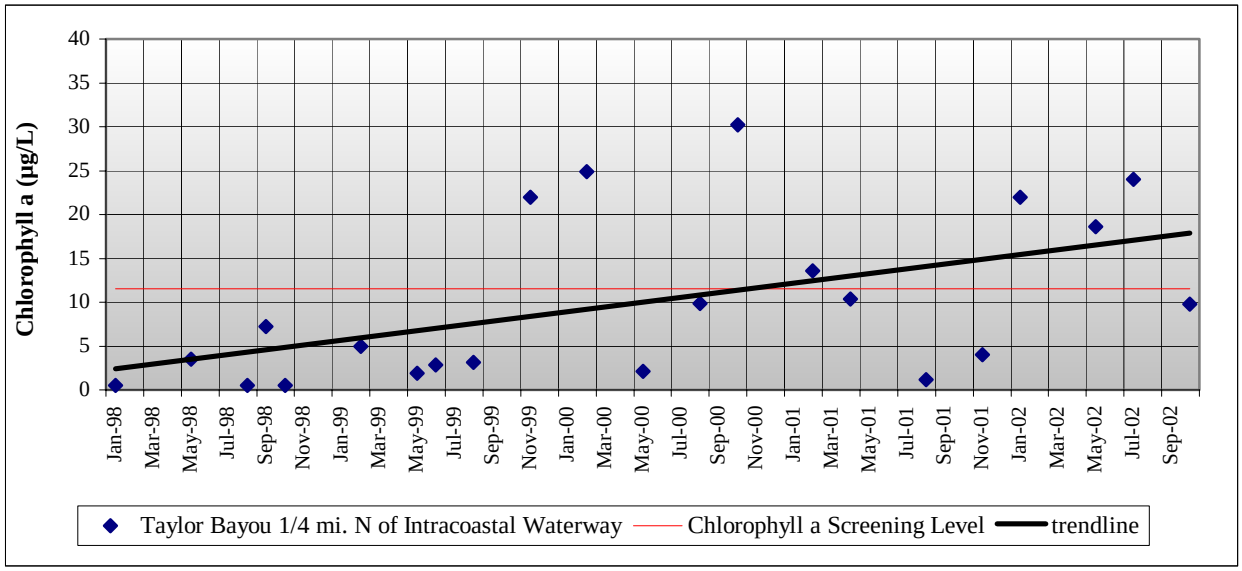
FS=Full Support, PS=Partial Support, NS=Not Supported, C = Concern, NC=No Concern, n/a=not applicable

Table 702.2-Metals Screening Levels for Segment 0702

Metal	*CRP_reporting limit*	*Acute screening level*	*Chronic screening level*
Aluminum	200	991	-
Arsenic	5.0	360	190
Cadmium	0.1	18.94	0.81
Cr (trivalent)	10.0	1143	136
Copper	1.0	11.86	8.27
Lead	0.1	42.6	1.66
Nickel	10.0	921	102
Selenium	2.0	20	5
Silver	0.5	0.92	-
Zinc	5.0	75.9	68.8

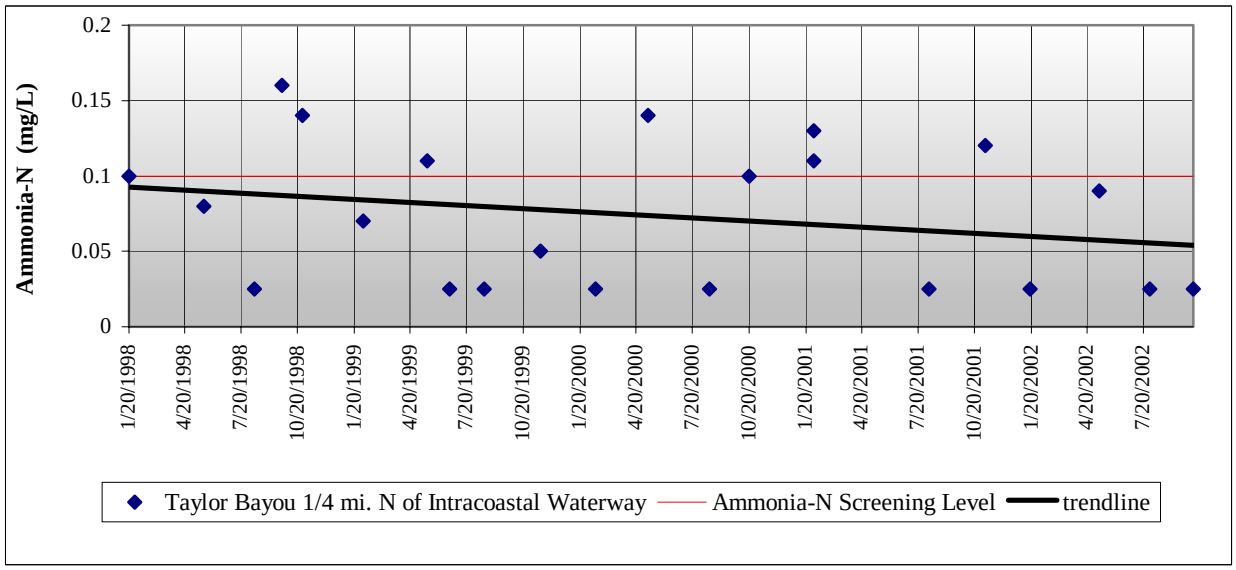
At Taylor Bayou ¼ mile north of the Intracoastal Waterway (Station Id_10640), concerns for both ammonia-nitrogen and chlorophyll were identified. Here, 32% of 22 measurements for ammonia-nitrogen exceeded the 0.10 mg/L (milligram per liter) screening level. Chlorophyll concentrations exceeded the 11.5 µg/L (microgram per liter) screening level 29% of the time. A temporal plot of chlorophyll samples indicates a positive trend or an increase in concentration over time; see Figure 702.3.

Figure 702.3-Chlorophyll Trend



Conversely, ammonia-nitrogen concentrations are decreasing during the same time period, as shown in Figure 702.4 below. When chlorophyll samples are plotted with ammonia-nitrogen samples no definite correlation is observed.

Figure 702.4-NH3 Trend



Furthermore, chlorophyll samples exceed its screening level over the full range of ammonia-nitrogen concentrations reported, as illustrated in Figure 702.5.

Figure 702.5-Chlorophyll vs NH3 Plot

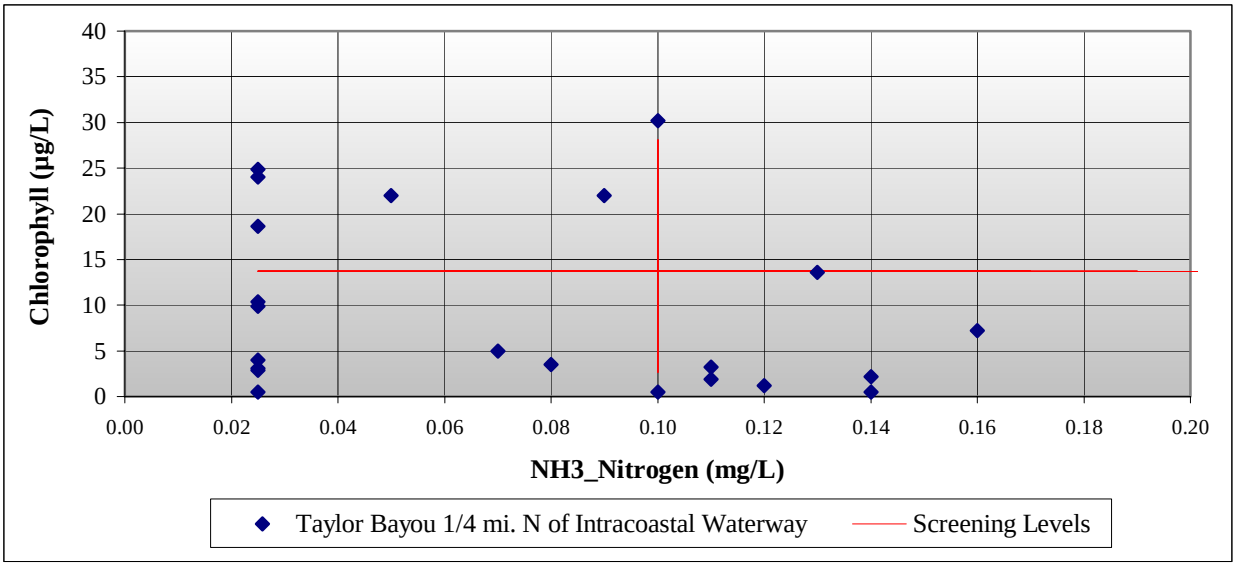


Figure 702.5 demonstrates that the production of chlorophyll may not be limited to the ammonia-nitrogen measured in the system.

One other location, Alligator Bayou at SH 82, was found to exceed the chlorophyll screening level for 88% of samples analyzed; however, the data set did not have the minimum number of samples necessary for an assessment. Due to the high percentage of exceedances this waterbody will be included as a concern for chlorophyll.

Alligator Bayou is a freshwater tributary of Taylor Bayou, with a watershed of approximately 40 square miles, upstream from the saltwater barrier. Discharges to the waterbody are primarily from municipal and industrial facilities, with a smaller amount from agricultural runoff.

Most importantly, the waterbody was identified as partially supporting the aquatic life use, due to ambient toxicity in water and sediment, and listed on the state's 303(d) List in 2000. Data assessed indicated that toxic conditions might exist in Alligator Bayou, as well as six other water bodies at various locations in the state. In response, the TCEQ conducted a project to confirm the presence of toxicity, and to determine its causes, where present.

The toxicity in water was recorded for one site upstream of SH 82, but ceased to occur after August 2001. Toxicity identification evaluation (TIE) procedures were conducted on the toxic water samples collected prior to August on two sites upstream from SH 82. Due to the high level of toxicity and the complex mixture of the compounds, identification of the cause is not possible with current technologies.

Considerable amounts of lethal and sublethal toxicity in sediment samples were also recorded. The toxicity in sediment is attributable to a combination of metals and organic compounds, and the degree of contamination in Alligator Bayou is considered substantial.

Recommendations

The toxicity in Alligator Bayou is complex mixture of compounds. Additional testing using more advanced techniques will be necessary to determine specific toxins.

Site specific criteria for dissolved oxygen should be considered by TCEQ with regards to Shallow Prong Lake. Dissolved oxygen fluctuations in the lake occur naturally due to the shallow depth and absence of water exchange with the local environment.

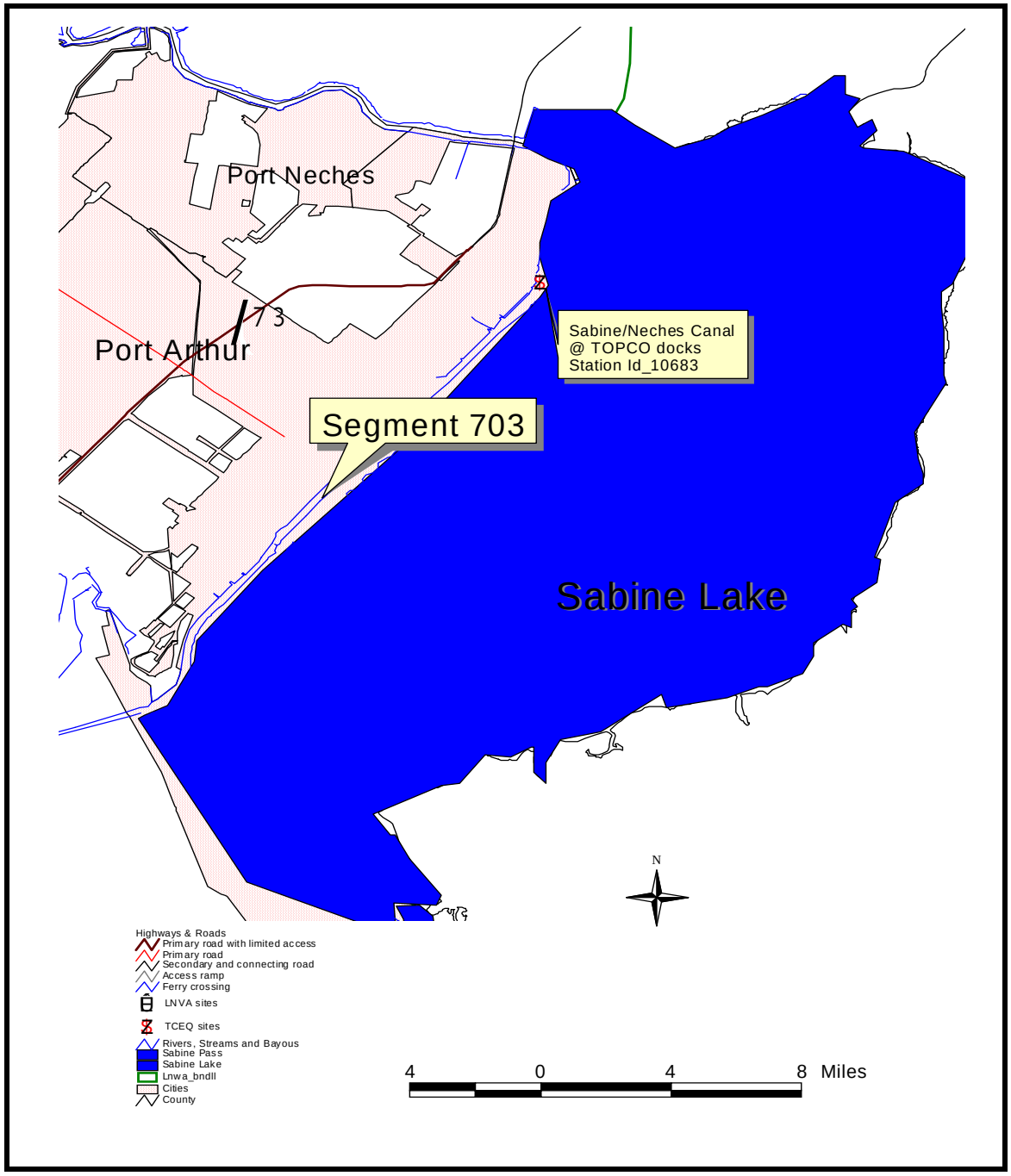
A review of nutrient and chlorophyll screening levels is recommended. TCEQ should review these screening levels and adjust accordingly for estuarine waters.

Segment 0703 – Sabine-Neches Canal Tidal

As defined in the Texas Surface Water Quality Standards, Segment 0703 is from the confluence with Sabine Pass at the southern tip Pleasure Island in Jefferson County to the Sabine Lake seawall at the northern tip of Pleasure Island in Jefferson County.

One site (10683) is routinely monitored quarterly by TCEQ for field, conventional lab parameters, bacteria and metals in water, see Figure 703.1.

Figure 703.1 – Sabine-Neches Canal Tidal Map



Background

Results of data analysis reported in the 2001 assessment indicated full support of the aquatic life use (dissolved oxygen), contact recreation (fecal coliform) and general use criteria (pH and water temperature). A water quality concern for chlorophyll *a* was identified in 2001.

Assessment Results

Segment 0703 is designated contact recreation and high aquatic life use. Numeric criteria listed in the Texas Surface Water Quality Standards (TSWQS) and nutrient screening levels are listed in Table 703.1along with data analysis results. Metals data are not available for this assessment period.

Overall the water quality of Segment 0703 is good. The contact recreational use is fully supported for the segment. Aquatic life use, as measured by dissolved oxygen and metals in water is fully supported. General use criteria for pH and water temperature are fully supported. Water quality standards for chloride, sulfate and total dissolved solids are not applicable to tidal segments.

Recommendations

It is recommended that TCEQ Region 10 continue monitoring the segment to insure stream standards and nutrient levels are met.

Table 703.1-Screening Results for Segment 0703

Segment 0703 -Sabine/Neches Canal Tidal	Aquatic Life Use			Contact Recreational Use	General Use Support Parameters					Nutrient Impact			
Station Id -Description	Dissolved Oxygen	Metals in Water	Organics in Water	Fecal Coliform	Temperature	pH	Chloride	Sulfate	Total Dissolved Solids	Nitrate + Nitrite (mg/L)	Ammonia-Nitrogen (mg/L)	Total Phosphate (mg/L)	Chlorophyll α (µg/L)
Screening level or Stream Criteria	≥ 4			≤ 400	≤ 35ºC (95ºF)	6.0-9.0	Not Applicable	Not Applicable	Not Applicable	≤ 0.26	≤ 0.10	≤ 0.22	≤ 11.5
10683 - Sabine/Neches Canal adjacent to TOPCO docks	FS	no data	no data	FS	FS	FS	n/a	n/a	n/a	no data	NC	NC	NC

FS=Full Support, PS=Partial Support, NS=Not Supported, C = Concern, NC=No Concern, n/a=not applicable

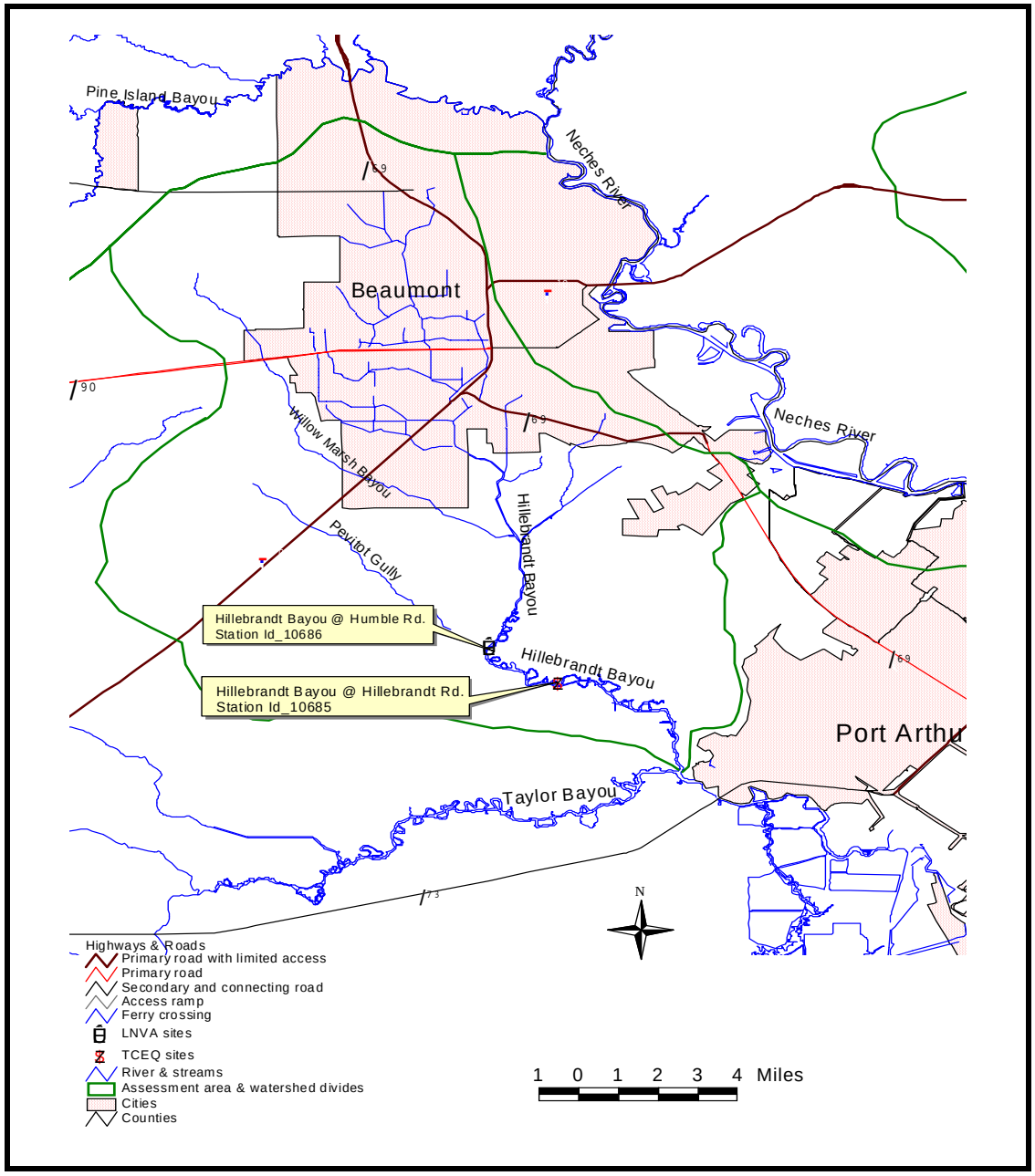
This page left blank intentionally

Segment 0704 – Hillebrandt Bayou

As defined in the Texas Surface Water Quality Standards, Segment 0704 is from the confluence of Taylor Bayou in Jefferson County to a point 100 meters (110 yards) upstream of SH 124 in Jefferson County.

Two sites are routinely monitored quarterly by TCEQ and LNVA for field parameters, conventional lab parameters, flow, bacteria and metals in water (see Figure 704.1).

Figure 704.1 – Hillebrandt Bayou Map



Background

Hillebrandt Bayou serves as the primary receiving stream for the storm drainage system within the city of Beaumont, accepting runoff from approximately 70% of the city. Willow Marsh Bayou, Kidd Gully and Pevitot Gully are tributaries conveying additional flows from agricultural land.

Previous assessments listed the segment as partially supporting its aquatic life use due to low dissolved oxygen (DO) levels (11% to 25% of data are less than the stream standard). These results prompted LNVA to collect 24-hour dissolved oxygen data for direct comparison to the stream standard (≥ 4 mg/L averaged over 24 hour period). Results of the intensively collected 24-hour DO data reported in the 2001 assessment indicated full support of the aquatic life use.

Other parameters reported in the 2001 assessment as not meeting water quality criteria or exceeding screening levels include total dissolved solids (TDS) and ammonia-nitrogen. The TDS standard for the segment is an average not to exceed 600 mg/L. The average TDS reported in the 2001 assessment was 725 mg/L. The ammonia-nitrogen screening level on the bayou is 0.17 mg/L. Data collected from the two site exceeded the screening level 50% - 67% of the time.

Assessment Results

Segment 0704 is designated contact recreation and intermediate aquatic life use. Numeric criteria listed in the Texas Surface Water Quality Standards (TSWQS) and nutrient-screening levels can be found in Table 704.1 along with data analysis results. Metals screening levels are listed in Table 704.2, below.

Data screening of dissolved oxygen (DO) samples indicate partial support of the aquatic life use (11% to 25% of data are less than the DO standard) at Station Id_10685 (Hillebrandt Bayou at Hillebrandt Rd.). At this site 12 % of the samples were less than the 4 mg/L standard. Upstream at Station Id_10686 (Hillebrandt Bayou at Humble Rd.) data analysis identified full support of the DO standard (< 10% of samples were less than DO standard).

Findings reported in the 2001 assessment identified partial support of the aquatic life use due to low dissolved oxygen levels in the bayou. Intensively collected data reveal 24-hour DO average supports the designated aquatic life use, and confirms the determination that low levels are not indicative to an oxygen consuming pollutant but rather to fluctuations in oxygen levels from algal respiration in the water body.

Table 704.1-Screening Results for Segment 0704

Segment 0704 - Hillebrandt Bayou	Aquatic Life Use			Contact Recreational Use	General Use Support Parameters					Nutrient Impact			
Station Id -Description	Dissolved Oxygen	Metals in Water	Organics in Water	Fecal Coliform	Temperature	pH	Chloride	Sulfate	Total Dissolved Solids	Nitrate + Nitrite (mg/L)	Ammonia-Nitrogen (mg/L)	Total Phosphate (mg/L)	Chlorophyll α (µg/L)
Screening level or Stream Criteria	≥ 4	See Table704.2		≤ 400	≤ 35ºC (95ºF)	6.0-9.0	≤ 250	≤ 100	≤ 600	≤ 2.76	≤ 0.17	≤ 0.8	≤ 11.6
10685 - Hillebrandt Bayou @ Hillebrandt Rd	PS	no data	no data	FS	FS	FS	FS	FS	no data	no data	C	NC	C
10686 - Hillebrandt Bayou @ Humble Rd	FS	FS	no data	FS	FS	FS	FS	FS	FS	NC	C	NC	no data

FS=Full Support, PS=Partial Support, NS=Not Supported, C = Concern, NC=No Concern, n/a=not applicable

Table 704.2-Metals Screening Levels for Segment 0704

Metal	*CRP_reporting limit*	*Acute screening level*	*Chronic screening level*
Aluminum	200	991	-
Arsenic	5.0	360	190
Cadmium	0.1	18.9	0.8
Cr (trivalent)	10.0	1142.8	136.2
Copper	1.0	11.9	8.3
Lead	0.1	42.6	1.7
Nickel	10.0	920.6	102.3
Selenium	2.0	20.0	5.0
Silver	0.5	0.9	-
Zinc	5.0	75.9	68.8

Analysis of fecal coliform data indicates full support of the contact recreational use.

General use criteria for pH, chloride, sulfate, total dissolved solids and water temperatures are fully supported.

Screening results also denote concerns (> 25% of the data exceed the screening level) for ammonia-nitrogen and chlorophyll *a*. High ammonia concentrations exceeded the 0.17 mg/L screening level for 57% of samples at Hillebrandt Bayou at Humble Road (Station Id_10686) and 29% downstream where the Hillebrandt Road crosses the bayou (see Figure 704.2). Similar results were reported in the 2001 assessment.

Figure 704.2-Range of NH3 Concentrations

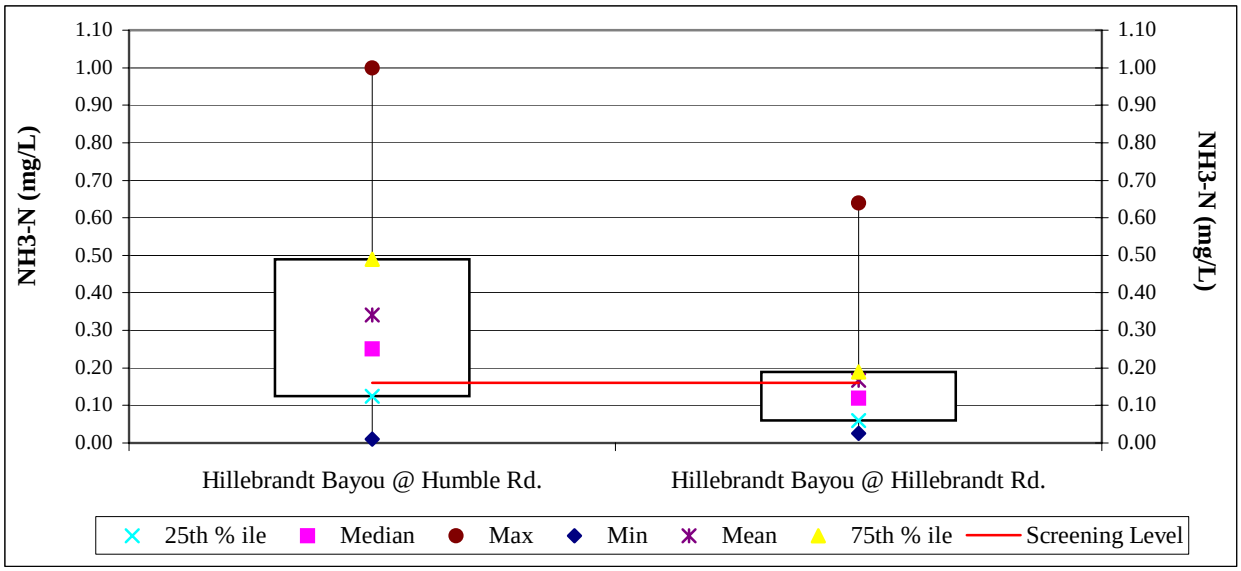
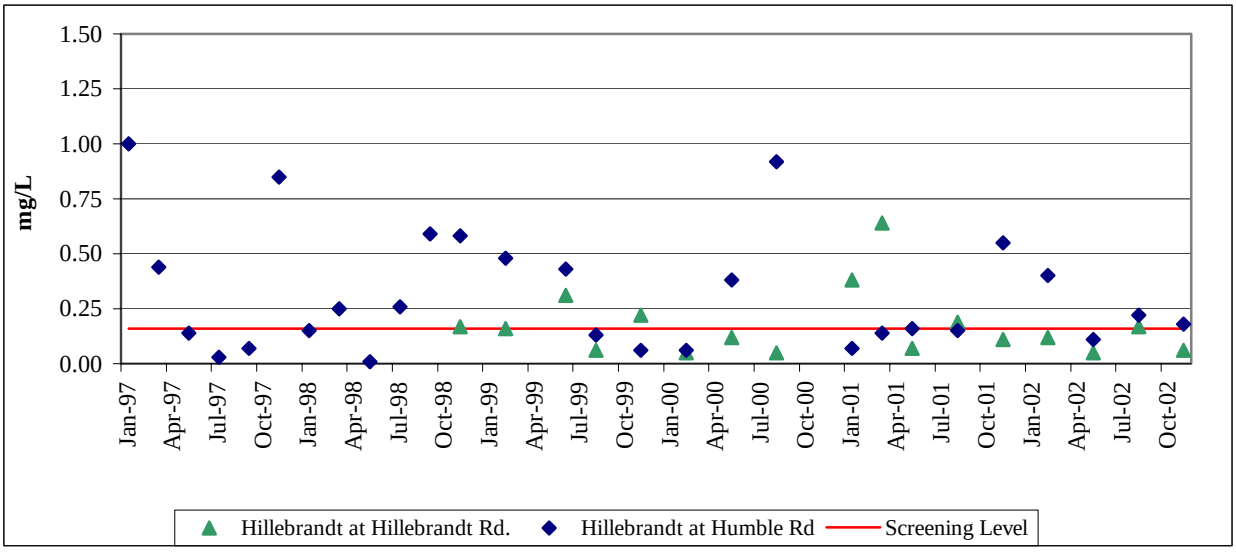


Figure 704.2 illustrates the range, or spread, of ammonia-nitrogen (NH3) concentrations measured from Hillebrandt Bayou. The 25th percentile, denoted 25th % ile on the graph, represents a concentration where 25 % of the samples are equal to or are less than. Similarly, the 75th percentile represents a concentration where 75% of samples are equal to or are less than. The median value represents a concentration where half of the samples are greater than and half are less than. In Figure 704.2 the median value for Hillebrandt Bayou at Humble Road is 0.25 mg/L.

Figure 704.3 is a temporal plot of ammonia values from both sites. No observable long term or seasonal trends are indicated. Flow data for the bayou are not available for correlation with ammonia data. No correlation could be found with pH, temperature, dissolved oxygen or fecal coliform.

Figure 704.3-NH3 Trend

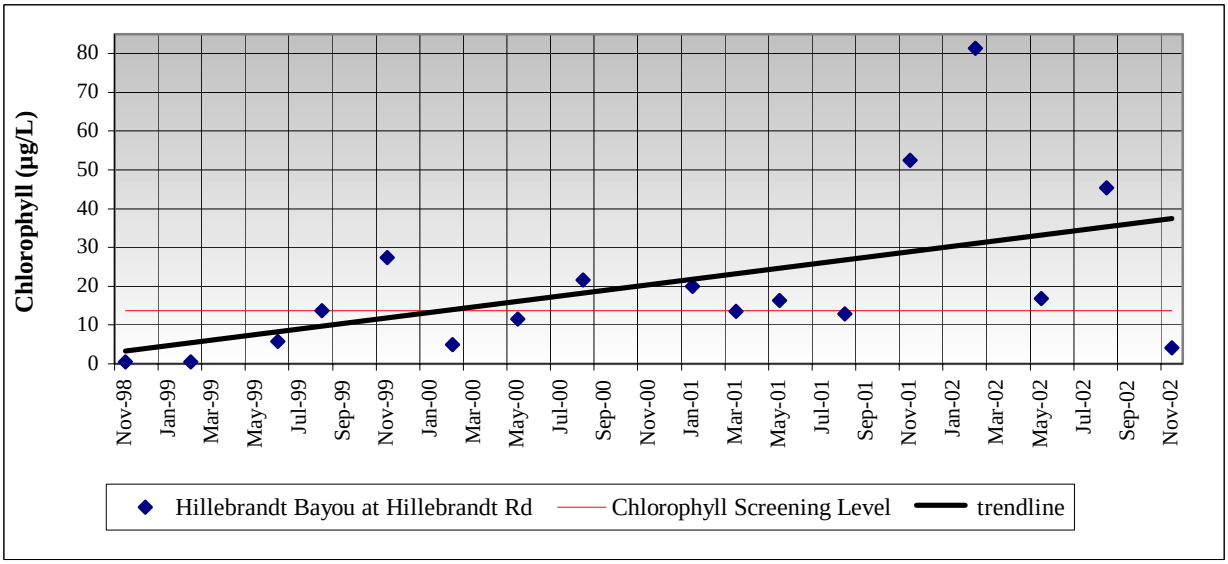


Chlorophyll was also identified as a concern at Station Id_10685 (Hillebrandt Bayou at Hillebrandt Rd). Samples for chlorophyll were not collected at the upstream site (Hillebrandt Bayou at Humble Rd). The screening level of 11.6 µg/L (read microgram per liter) was exceeded by 65% of samples available for analysis.

Similar to the ammonia, the chlorophyll concentrations can't be correlated with pH, temperature, dissolved oxygen or fecal coliform.

Figure 704.4 is a temporal plot of chlorophyll values. There is an increasing trend of chlorophyll with time.

Figure 704.4-Chlorophyll Trend



Concerns due to high concentrations of ammonia-nitrogen, chlorophyll and the partial support of dissolved oxygen standard maybe related. As a nutrient, ammonia-nitrogen is the food promoting the proliferation of algae in the bayou, thus increasing the chlorophyll levels. Photosynthesis is generally responsible for the commonly observed oxygen fluctuations in a 24-hour period. The 24-hour fluctuation of dissolved oxygen increases from a low around dawn to a high in the late afternoon and then steadily decreases throughout the night due to continuing demands of community respiration.

Recommendations

In response to the cycle of nutrient input, increased chlorophyll production and fluctuating dissolved oxygen, LNVA has developed a proactive strategy to address this issue. For the 2004 – 2005 Clean Rivers Program biennium, LNVA will form a stakeholder's workgroup to investigate possible cause(s) of high ammonia-nitrogen concentrations in Hillebrandt Bayou.

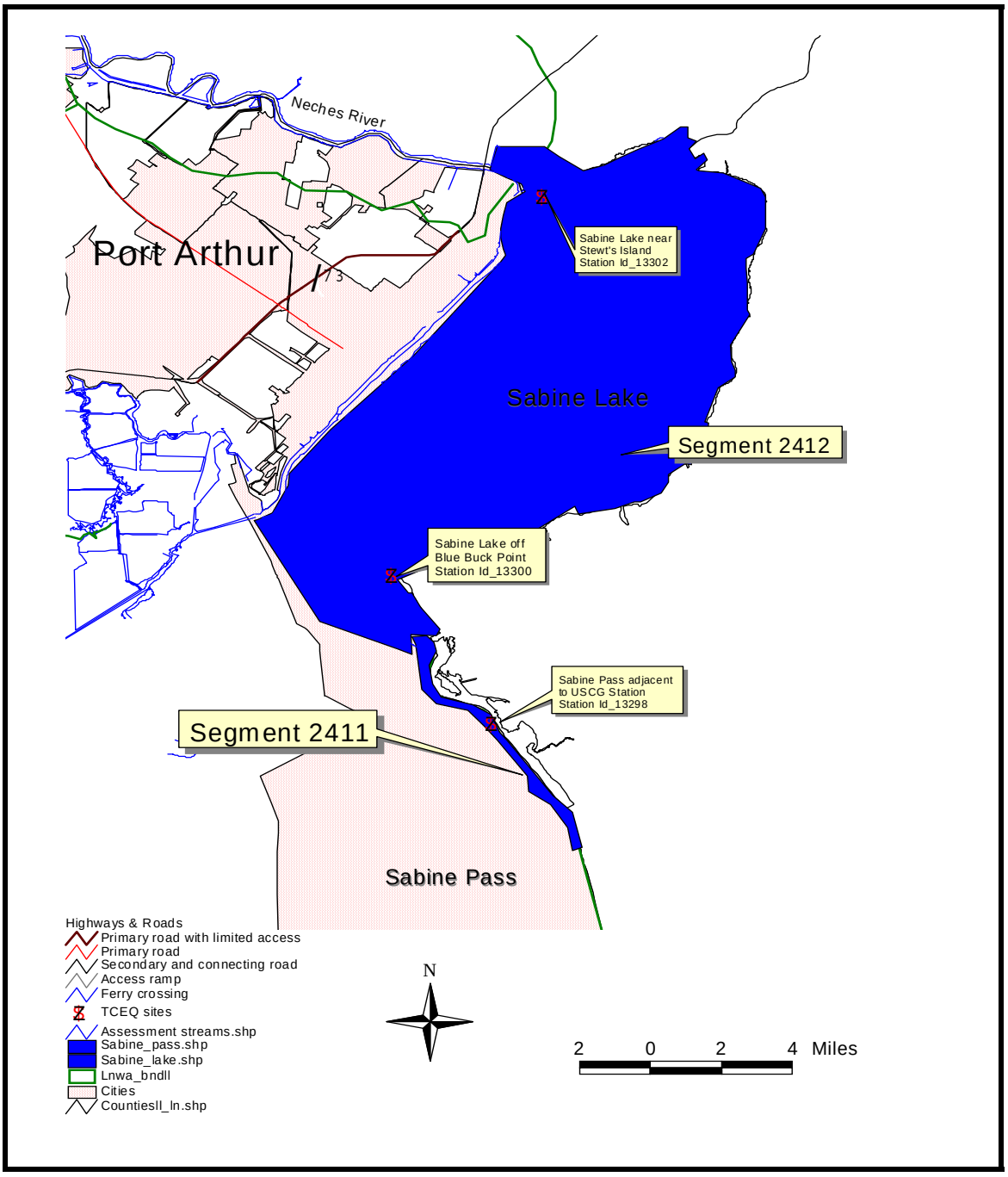
The objective is to determine the origin (point source or non-point source) of the elevated ammonia-nitrogen in the water body, and develop a water quality management approach that will help lower instream ammonia-nitrogen levels. Initial work on this project will be to develop a segment wide inventory of permitted discharges and obtain updated landuse coverage for the watershed. Based on the findings of the stakeholder workgroup, LNVA will coordinate future activity with TCEQ Region 10.

Segment 2411 & 2412 – Sabine Pass and Sabine Lake

As defined in the Texas Surface Water Quality Standards, Segment 2411 is from the end of the jetties at the Gulf of Mexico to SH 82. Segment 2412 is Sabine Lake.

TCEQ routinely monitors one site in Segment 2411 and two sites in Segment 2412 for field, conventional lab parameters and bacteria (see Figure 2411.1).

Figure 2411.1 – Sabine Pass and Sabine Lake Map



Background

Results of data analysis reported in the 2001 assessment indicated full support of the aquatic life use (dissolved oxygen), contact recreation (fecal coliform) and general use criteria (pH and water temperature). No water quality concerns for nutrients or chlorophyll *a* were identified in the last assessment.

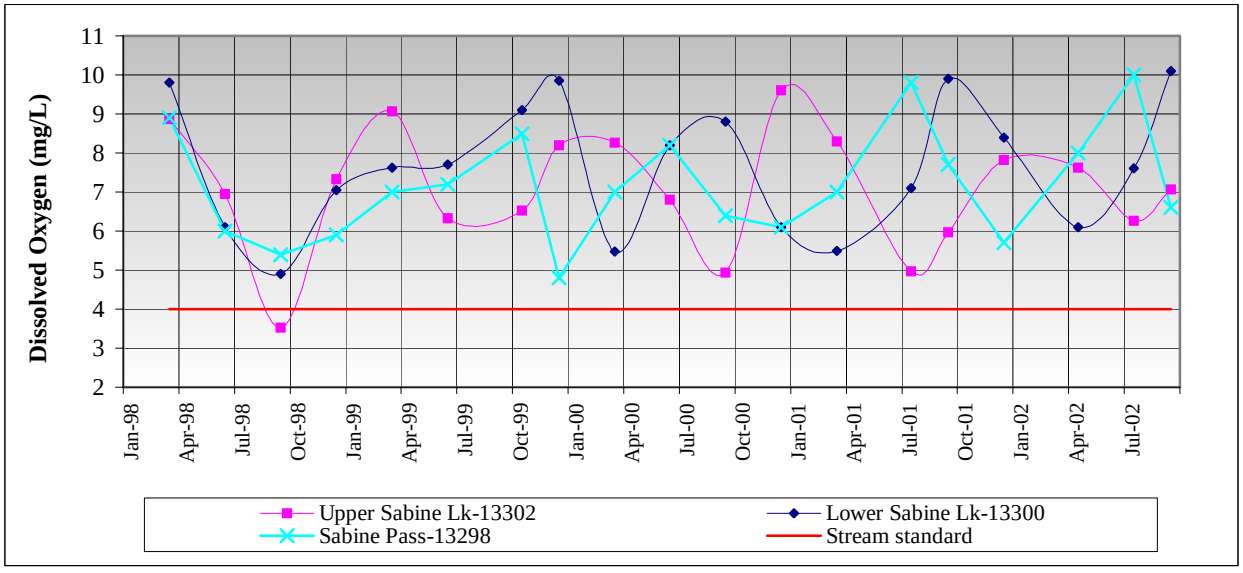
Assessment Results

Segment 2411 is designated contact recreation and excellent aquatic life use. Numeric criteria listed in the Texas Surface Water Quality Standards (TSWQS) and nutrient-screening levels can be found in Table 2411 along with data analysis results. Metals data are not available for this assessment period.

Segment 2412 is designated contact recreation and high aquatic life use. Numeric criteria listed in the Texas Surface Water Quality Standards (TSWQS) and nutrient-screening levels can be found in Table 2412 along with data analysis results. Metals data are not available for this assessment period.

The segment fully supports the aquatic life use as measured by dissolved oxygen (DO). Figure 2411.2 shows the temporal plot for DO on Sabine Lake - Segment 2412 and Sabine Pass – Segment 2411.

Figure 2411.2 – Dissolved Oxygen in Segments 2411 & 2412



The dissolved oxygen fluctuations shown in Figure 2411.2 may be due to tidal interaction.

Overall, the water quality of the segments is good. Contact recreational use is fully supported, with no concerns due to nutrients or chlorophyll. The general use criteria for pH and water temperature are fully supported. Water quality standards for chloride, sulfate and total dissolved solids are not applicable to tidal segments.

Recommendations

It is recommended that TCEQ Region 10 continue monitoring the segments to insure stream standards and nutrient levels are met.

Table 2411–Screening Results for Segment 2411

Segment 2411- Sabine Pass	Aquatic Life Use			Contact Recreational Use	General Use Support Parameters					Nutrient Impact			
Station Id -Description	Dissolved Oxygen	Metals in Water	Organics in Water	Fecal Coliform	Temperature	pH	Chloride	Sulfate	Total Dissolved Solids	Nitrate + Nitrite (mg/L)	Ammonia-Nitrogen (mg/L)	Total Phosphate (mg/L)	Chlorophyll α (µg/L)
Screening level or Stream Criteria	≥ 5			≤ 400	≤ 35ºC (95ºF)	6.0-9.0	Not Applicable	Not Applicable	Not Applicable	≤ 0.26	≤ 0.10	≤ 0.22	≤ 11.5
13298 - Sabine Pass adjacent to USCG Station	FS	no data	no data	FS	FS	FS	n/a	n/a	n/a	no data	NC	NC	NC

Table 2412–Screening Results for Segment 2412

Segment 2412 - Sabine Lake	Aquatic Life Use			Contact Recreational Use	General Use Support Parameters					Nutrient Impact			
Station Id -Description	Dissolved Oxygen	Metals in Water	Organics in Water	Fecal Coliform	Temperature	pH	Chloride	Sulfate	Total Dissolved Solids	Nitrate + Nitrite (mg/L)	Ammonia-Nitrogen (mg/L)	Total Phosphate (mg/L)	Chlorophyll α (µg/L)
Screening level or Stream Criteria	≥ 4			≤ 400	≤ 35ºC (95ºF)	6.0-9.0	Not Applicable	Not Applicable	Not Applicable	≤ 0.26	≤ 0.10	≤ 0.22	≤ 11.5
13300 - Sabine Lake off Blue Buck Point	FS	no data	no data	FS	FS	FS	n/a	n/a	n/a	no data	NC	NC	NC
13302 - Sabine Lake near Stewts Island	FS	no data	no data	FS	FS	FS	n/a	n/a	n/a	no data	NC	NC	NC

FS=Full Support, PS=Partial Support, NS=Not Supported, C = Concern, NC=No Concern, n/a=not applicable

IV. CONCLUSIONS and RECOMMENDATIONS

The Clean Rivers Program utilizes a watershed management approach to identify and evaluate water quality issues, establish priorities for corrective action, and work to implement those actions. Below is a narrative of the water quality conditions assessed in this report followed by recommendations.

Water quality in the assessment area is good. Numerous monitoring sites within the 12 classified segments fully support their designated uses with no water quality concerns due to nutrient impacts. However, data screening results recognized problems previously reported as well as identifying new ones. Data screening results for the lower Neches Basin can be found in Appendix B, results for the Neches-Trinity Coastal Basin are located in Appendix C.

Water Quality in the Lower Neches Basin

Long-standing problems are still evident in the lower Neches Basin, such as low dissolved oxygen and low pH values in tributaries to the Neches River. Other impairments include elevated bacteria, high ammonia-nitrogen and increased dissolved metals in lower Neches Basin.

A non-support or partial support of aquatic life use due to low dissolved oxygen (DO) levels throughout Pine Island Bayou and tributaries to Village Creek still persists. The occurrence of depressed DO in both watersheds is probably due to natural causes such as high ambient summer temperatures, low stream velocities, and decaying forest material. Low pH values are also frequent on the mainstem of Village Creek, resulting in a partial support of its general use criterion. Average pH values in the Village Creek watershed range from 5.2 to 6.7 units and are considered a natural condition. Two routine monitoring sites on Village Creek are each impacted by either Beech Creek or Cypress Creek, both of which are highly stained due to decaying organic matter with average pH values less than the lower standard of 6.0 units.

Other water quality conditions identified within the lower Neches Basin include elevated bacteria and ammonia-nitrogen. Elevated bacteria levels occurred at 3 sites in Segments 0603 and 0608. The factors contributing to or correlated with elevated bacteria, such as streamflow, are inconclusive. Temporal plots indicate a decreasing trend for bacteria in Segment 0608 and no trend in Segment 0603. A water quality concern due to high ammonia-nitrogen concentrations was identified at one site in Pine Island Bayou. Spatial and temporal plots are not indicative of a source or condition for high ammonia-nitrogen values.

The most conspicuous finding is the high number of non- support results of dissolved metals for both chronic and acute screening levels. In Segment 0607 – Pine Island Bayou, acute screening levels were exceeded by aluminum and zinc while chronic screening levels were surpassed by cadmium and lead samples. Similarly, chronic levels of lead and cadmium were also high in Segment 0608 – Village Creek, as well as acute levels of aluminum. Due to the natural occurrence of aluminum in clayey soils around the assessment area, a correlation of turbidity and aluminum was found. This relationship, however, does not explain the presence of zinc, cadmium and lead detected in the water bodies.

Water Quality in the Neches-Trinity Coastal Basin

Water quality issues identified within the Neches-Trinity Coastal Basin include low dissolved oxygen, high levels of dissolved aluminum, elevated ammonia-nitrogen and chlorophyll *a* concentrations, and ambient toxicity in water and sediment.

Partial support of the dissolved oxygen (DO) criterion occurred in Taylor and Hillebrandt Bayous while a non-support was identified in Shallow Prong Lake on Big Hill Bayou. Intensive 24-hour DO data was collected for Hillebrandt Bayou and Taylor Bayou were reported in 2001. The low oxygen is not indicative to an oxygen consuming pollutant in Hillebrandt Bayou, but rather to daily fluctuations due to algae in the waterbody. Low levels of DO in Taylor Bayou are not uncommon. Compared to the previous assessment, current partial support of DO is an improvement form the non-support reported in 2001.

Water quality concerns where documented for ammonia-nitrogen in Hillebrandt Bayou and the Intracoastal Waterway segments. Ammonia-nitrogen values indicate a decrease with time in the two water bodies. This trend may be skewed due to recent low concentrations. Additional water quality concerns where recognized in Taylor Bayou, Hillebrandt Bayou, and the Intracoastal Waterway for high concentrations of chlorophyll *a*. A temporal plot of chlorophyll indicates a positive trend or an increase with time. No correlation was found between nutrients (ammonia-nitrogen and total phosphorous) and chlorophyll *a*.

Another waterbody in the Neches-Trinity Coastal Basin with a history of impairment is Alligator Bayou. Alligator Bayou is a freshwater tributary of Taylor Bayou, with a watershed of approximately 40 square miles, upstream from the saltwater barrier. Discharges to the waterbody are primarily from municipal and industrial facilities, with a smaller amount from agricultural runoff. The waterbody was identified as partially supporting the aquatic life use, due to ambient toxicity in water and sediment, and listed on the state's 303(d) List in 2000. Due to the high level of toxicity in water and the complex mixture of the compounds, identification of the cause is not possible with current technologies. Considerable amounts of lethal and sub-lethal toxicity were found in sediments. The toxicity in sediment is attributable to a combination of metals and organic compounds. Additional testing using more advanced techniques will be necessary to determine specific toxins.

Not all screening results revealed impairments. The contact recreational use and general use criteria, where applicable, are fully supported for all water bodies in the Neches-Trinity Coastal Basin.

Recommendations

To address the assessment of data screening results, LNVA has developed a Basin Action Summary to use as a resource for water quality management planning. The Basin Action Summary, with prioritized recommendations, can be found in Appendix A.
For the next biennium (September 2003 – August 2005), LNVA will work closely with the TCEQ to focus on the following priority impairments:

- → Resolve low dissolved oxygen impairment on Pine Island Bayou by assisting TCEQ with a Use Attainability Analysis to determine appropriateness of the standard.
- → In Spring 2004, hold first meeting with stakeholder workgroup to address elevated ammonia-nitrogen concentrations in Hillebrandt Bayou.
- → Increase metals in water sampling and analysis to ascertain source(s) of aluminum, lead, cadmium, and zinc in the Village Creek and Pine Island Bayou watersheds.
- → Recommend a Special Study by TCEQ Region 10 to focus on low dissolved oxygen levels in Taylor Bayou.

Basinwide recommendations during the next biennium include the following:

- → Sustain the routine monitoring program data collection efforts.
- → Evaluate nutrient data towards the development of criteria in the assessment area.
- → Promote public outreach and educational efforts.

The Clean Rivers Program is unmatched with the success of its data collection and dissemination efforts, and inter-agency cooperation since its inception in 1991. However, funding is critical to the continued success of CRP and to meeting the goal to maintain and improve the quality of water within each river basin.

All CRP planning agencies are being asked to increase monitoring efforts while meeting stringent quality assurance requirements on static budgets. In 2001, the 77th Legislature passed House Bill 2912 mandating TCEQ (then TNRCC) to consolidate the water quality assessment fee (referred to as the Clean Rivers Fee) and the waste treatment inspection fee. Consolidation of funds will not guarantee the Clean Rivers Program will receive the level of funding it had previously. If quality surface waters are to be protected then increasing program funding discussions should commence at the steering committee and stakeholders level and continue to the legislature.

This page left blank intentionally

Appendix A

Basin Action Summary

Basin Action Summary

Water Body	Impairment	Identified Parameters	Explanation of Water Quality	Actions Taken	Recommended Actions	Priority
Pine Island Bayou and tributaries	1. Aquatic Life Use 2. Aquatic Life Use 3. WQ Concern	1. Dissolved oxygen 2. Metals in water 3. Ammonia-nitrogen	1. Natural condition 2. Insufficient data 3. Possible Non-point	1.Aquired 24-hr. intensive D.O. data for 2 yrs. 2.Aquired funds for additional sampling 3. Assessed Concern	1. UAA or review standards 2. Continue metals sampling 3. Continue monitoring	1. H 2. H 3. M
Village Creek and tributaries	1. Aquatic Life Use 2. Aquatic Life Use 3. Contact Recreation 4. General Use	1. Dissolved oxygen 2. Metals 3. Bacteria 4. pH	1. Natural Occurrence 2. Insufficient data 3. Inconclusive 4. Natural Occurrence	1. DO Study 2. Routine Monitoring 3. Special Study 4. Routine Monitoring	1. Schedule UAA with TCEQ or review standards 2. Continued metals sampling 3. Develop strategy with TCEQ to address this issue. 4. Review Stream Standard	1. L 2. H 3. M 4. L
Hillebrandt Bayou	Water Quality Concern	Nutrient enrichment of ammonia-nitrogen	Point or non-point source, possible failing septic systems	Assessed Concern	Form stakeholder workgroup to determine source(s) and course of action	H
Sandy Creek	Contact Recreation	Bacteria	Inconclusive	LNVA routine monitoring	Develop strategy with TCEQ to address this issue	L
Neches River Tidal	Aquatic Life Use	Malathion	Possible aerial application of mosquito spray	TCEQ Region 10 routine monitoring	Evaluate Region 10 monitoring of organics	M
Shallow Prong Lake	Aquatic Life Use	Dissolved oxygen (DO)	Natural condition	TCEQ Region 10 routine monitoring	Reassess 303(d) listing	N/A
Taylor Bayou	Aquatic Life Use	Dissolved oxygen (DO)	Natural condition	Recommended Aquatic Habitat Study	Aquatic Habitat Study by TCEQ Region 10	H
Star Lake Canal	Aquatic Life Use	L Dissolved oxygen (DO)	Natural condition	TCEQ Region 10 routine monitoring	Continued monitoring by TCEQ Region 10	N/A
B.A. Steinhagen Lake	Public Use (Fish Consumption)	Mercury in Fish Tissue	Air Deposition	N/A	TCEQ Special Study	N/A
Lake Kimball	Public Use (Fish Consumption)	Mercury in Fish Tissue	Air Deposition	N/A	TCEQ Special Study	N/A
Alligator Bayou	Aquatic Life Use	Toxicity in sediment and water/impaired fish community	Point source pollution	TMDL near completion	N/A	N/A

Appendix B

Steering Committee Members

Mr. Leslie McMahen, City Manager
City of Port Arthur

Mr. George Newsome
City of Groves

Ms. Kathleen Jackson
Mobil Oil Corporation

Mr. Terry Swan
Entergy

Dr. M.O. Way, Associate Professor of Entomology
Texas A & M University
Agricultural Research and Extension Center

Mr. Terry D. Stelly, Ecosystem Biologist
Texas Parks & Wildlife Department, Coastal Fisheries

Mr. Burl Carraway
Texas Forest Service

Mr. Joseph G. Majdalani, Water Utilities Manager
City of Beaumont

Mr. José Alvarez
DuPont Beaumont Works

Mr. Jerry Mambretti
Texas Parks & Wildlife, Coastal Fisheries

Mr. Tim Praznik
Huntsman Petrochemical Corporation

Mr. Merlin Breaux
Lower Neches Soil & Water Conservation Dist. #437

Mr. Mike Foster, Director Water Quality
Southeast Texas Regional Planning Commission

Steering Committee Members (continued)

Mr. Richard Strahan
Big Thicket National Preserve

Mr. Greg Bryant
Texas Commission on Environmental Quality

Mr. Lowell Putzier
Concerned Citizen

Dr. Richard Harrel
Clean Air & Water, Inc.

Mr. J.T. Ewing
Texas General Land Office
Oil Spill Prevention and Response

Mr. Ken McCain
U.S. Department of Agriculture
Natural Resources Conservation Service

Mr. David Hancock
Angelina Neches River Authority

Mr. Darrell Commander
Acquatic Services

Mr. Taylor Shelton, P.E., Director of Public Works
City of Port Neches

Mr. Scott Griffith
Texas Commission on Environmental Quality-Region 10

Appendix C

Data Screening Results

Lower Neches Basin

Segment 0601 – Neches River Tidal
Conventional Parameters

Nutrient Impact

Segment	601	601	601	601	601
Waterbody / Station Description	Star Lake Canal	Neches R. @ SH 87	Neches R. @ Pt. Neches Park	Neches R. 1/2 mi. below Mobile Canal	Neches R. @ IH-10
On/Off Segment	Off	On	On	On	On
Station_Id	10485	10563	10566	10570	10575
NO2+NO3-N (mg/L)					
Screening Level	≤ 2.34	≤ 2.34	≤ 2.34	≤ 2.34	≤ 2.34
Maximum	-	-	-	-	-
Minimum	-	-	-	-	-
Mean	-	-	-	-	-
No. Samples	No Data	No Data	No Data	No Data	No Data
% exceedance	-	-	-	-	-
Assessment	-	-	-	-	-
NH3-N (mg/L)					
Screening Level	≤ 0.44	≤ 0.44	≤ 0.44	≤ 0.44	≤ 0.44
Maximum	1.25	0.17	0.45	0.58	0.08
Minimum	0.03	0.03	0.03	0.03	0.03
Mean	0.29	0.04	0.06	0.09	0.04
No. Samples	20	20	20	20	18
% exceedance	20%	0%	5%	10%	0%
Assessment	No Concern	No Concern	No Concern	No Concern	No Concern
Total PO4 (mg/L)					
Screening Level	≤ 1.11	≤ 1.11	≤ 1.11	≤ 1.11	≤ 1.11
Maximum	5.90	0.10	0.09	0.12	0.14
Minimum	0.08	0.02	0.01	0.02	0.02
Mean	0.86	0.07	0.06	0.07	0.08
No. Samples	20	21	21	21	20
% exceedance	15%	0%	0%	0%	0%
Assessment	No Concern	No Concern	No Concern	No Concern	No Concern
Chlorophyll α (µg/L)					
Screening Level	≤ 23	≤ 23	≤ 23	≤ 23	≤ 23
Maximum	20.4	9.2	8.9	10.7	10
Minimum	0.5	0.5	0.5	0.5	0.5
Mean	5.763	2.1	2.7	3.3	3.3
No. Samples	20	23	21	21	20
% exceedance	0%	0%	0%	0%	0%
Assessment	No Concern	No Concern	No Concern	No Concern	No Concern

Use Support Criteria

Segment	601	601	601	601	601
Waterbody / Station Description	Star Lake Canal	Neches R. @ SH 87	Neches R. @ Pt. Neches Park	Neches R. 1/2 mi. below Mobile Canal	Neches R. @ IH-10
On/Off Segment	Off	On	On	On	On
Station_Id	10485	10563	10566	10570	10575
Dissolved Oxygen (mg/L)					
Screening Level	≥ 3	≥ 3	≥ 3	≥ 3	≥ 3
Maximum	9.3	9.9	10.1	10.1	10.1
Minimum	2.2	4.1	3.8	3.2	4.4
Mean	5.6	7.0	6.9	6.8	7.2
No. Samples	20	19	21	21	21
% exceedance	10%	0%	0%	0%	0%
Assessment	Full Support	Full Support	Full Support	Full Support	Full Support
Fecal Coliform (#/100mL)					
Screening Level	≤ 400	≤ 400	≤ 400	≤ 400	≤ 400
Maximum	600	263	266	573	600
Minimum	7	2	2	17	2
Mean	174	66	74	133	94
No. Samples	18	31	21	32	24
% exceedance	11%	0%	0%	9%	8%
Assessment	Full Support	Full Support	Full Support	Full Support	Full Support

General Use Support Criteria

Segment	601	601	601	601	601
Waterbody / Station Description	Star Lake Canal	Neches R. @ SH 87	Neches R. @ Pt. Neches Park	Neches R. 1/2 mi. below Mobile Canal	Neches R. @ IH-10
On/Off Segment	Off	On	On	On	On
Station_Id	10485	10563	10566	10570	10575
pH (std. units)					
Screening Level	Not Applicable	6.0 - 8.5	6.0 - 8.5	6.0 - 8.5	6.0 - 8.5
Maximum	-	7.9	7.8	7.9	10.2
Minimum	-	6.2	6.2	6.0	6.1
Mean	-	7.0	7.0	6.8	7.0
No. Samples	-	204	247	189	123
% exceedance	-	0%	0%	0%	0%
Assessment	-	Full Support	Full Support	Full Support	Full Support
Water Temperature (ºC)					
Screening Level	Not Applicable	≤ 35	≤ 35	≤ 35	≤ 35
Maximum	-	33.0	32.0	32.7	32.9
Minimum	-	10.1	9.7	9.9	10.1
Mean	-	19.9	19.9	18.6	20.5
No. Samples	-	204.0	247.0	189.0	123.0
% exceedance	-	0%	0%	0%	0%
Assessment	-	Full Support	Full Support	Full Support	Full Support
Chloride (mg/L)	*(Average value must not exceed Texas Surface Water Quality Standard).*				
Screening Level	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Mean	-	-	-	-	-
No. Samples	-	-	-	-	-
Use Support	-	-	-	-	-
Sulfate (mg/L)	*(Average value must not exceed Texas Surface Water Quality Standard).*				
Screening Level	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Mean	-	-	-	-	-
No. Samples	-	-	-	-	-
Use Support	-	-	-	-	-
Total Dissolved Solids (mg/L)	*(Average value must not exceed Texas Surface Water Quality Standard).*				
Screening Level	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Mean	-	-	-	-	-
No. Samples	-	-	-	-	-
Use Support	-	-	-	-	-

Segment 0601 – Neches River Tidal - Metals Data

Segment	***601***	***601***	***601***	***601***	***601***
Waterbody	Star Lake Canal	Neches R. @ SH 87	Neches R. @ Pt. Neches Park	Neches R. 1/2 mi. below Mobil canal	Neches R. @ IH 10
On/Off Segment	Off	On	On	On	On
Station_Id	10485	10563	10566	10570	10575
Aluminum (AWRL = 200 ppb)					
Chronic Screening Level	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Support (Y/N)	-	-	-	-	-
Acute Screening Level	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
% exceeeds acute criteria	-	-	-	-	-
No. Samples	-	-	-	-	-
Support (Y/N)	-	-	-	-	-
Arsenic (AWRL = 5 ppb)					
Chronic Screening Level	78	78	78	78	78
Support (Y/N)	Y	Y	No Data	No Data	Y
Acute Screening Level	149	149	149	149	149
% exceeeds acute criteria	0%	0%	No Data	No Data	0%
No. Samples	4	11	No Data	No Data	11
Support (Y/N)	Y	Y	-	-	Y
Cadmium (AWRL = 0.1ppb)					
Chronic Screening Level	10	10	10	10	10
Support (Y/N)	Y	Y	No Data	No Data	Y
Acute Screening Level	45.4	45.4	45.4	45.4	45.4
% exceeeds acute criteria	0%	0%	No Data	No Data	0%
No. Samples	4	11	No Data	No Data	11
Support (Y/N)	Y	Y	-	-	Y
Chromium (AWRL = 10 ppb)					
Chronic Screening Level	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Support (Y/N)	-	-	-	-	-
Acute Screening Level	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
% exceeeds acute criteria	-	-	-	-	-
No. Samples	-	-	-	-	-
Support (Y/N)	-	-	-	-	-
Copper (AWRL =1.0 ppb)					
Chronic Screening Level	3.6	3.6	3.6	3.6	3.6
Support (Y/N)	Y	Y	No Data	No Data	Y
Acute Screening Level	13.5	13.5	13.5	13.5	13.5
% exceeeds acute criteria	0%	0%	No Data	No Data	0%
No. Samples	4	11	No Data	No Data	11

Support (Y/N)	Y	Y	-	-	Y

Segment	***601***	***601***	***601***	***601***	***601***
Waterbody	Star Lake Canal	Neches R. @ SH 87	Neches R. @ Pt. Neches Park	Neches R. 1/2 mi. below Mobil canal	Neches R. @ IH 10
On/Off Segment	Off	On	On	On	On
Station_Id	10485	10563	10566	10570	10575
Lead (AWRL = 0.1 ppb)					
Chronic Screening Level	5.3	5.3	5.3	5.3	5.3
Support (Y/N)	Y	Y	No Data	No Data	Y
Acute Screening Level	133	133	133	133	133
% exceeeds acute criteria	0%	0%	No Data	No Data	0%
No. Samples	4	11	No Data	No Data	4
Support (Y/N)	Y	Y	-	-	Y
Nickel (AWRL = 10 ppb)					
Chronic Screening Level	13.1	13.1	13.1	13.1	13.1
Support (Y/N)	Y	Y	No Data	No Data	Y
Acute Screening Level	118	118	118	118	118
% exceeeds acute criteria	0%	0%	No Data	No Data	0%
No. Samples	4	11	No Data	No Data	11
Support (Y/N)	Y	Y	-	-	Y
Selenium (AWRL = 2 ppb)					
Chronic Screening Level	136	136	136	136	136
Support (Y/N)	Y	Y	No Data	No Data	Y
Acute Screening Level	564	564	564	564	564
% exceeeds acute criteria	0%	0%	No Data	No Data	0%
No. Samples	4	11	No Data	No Data	11
Support (Y/N)	Y	Y	-	-	Y
Silver (AWRL = 0.5 ppb)					
Chronic Screening Level	NA	NA	NA	NA	NA
Support (Y/N)	NA	NA	NA	NA	NA
Acute Screening Level	2	2	2	2	2
% exceeeds acute criteria	0%	0%	No Data	No Data	0%
No. Samples	4	11	No Data	No Data	10
Support (Y/N)	Y	Y	-	-	Y
Zinc (AWRL = 5 ppb)					
Chronic Screening Level	84.2	84.2	84.2	84.2	84.2
Support (Y/N)	Y	Y	No Data	No Data	Y
Acute Screening Level	92.7	92.7	92.7	92.7	92.7
% exceeeds acute criteria	0%	0%	No Data	No Data	0%
No. Samples	4	11	No Data	No Data	11

Support (Y/N)	Y	Y	-	-	Y

Segment 0602 – Neches River below B. A. Steinhagen Lake
Conventional Parameters

Nutrient Impact

Segment	602	602	602
Waterbody / Station Description	Neches R. @ US 96	NR @ 1013	NR _ LKVW
On/Off Segment	ON	ON	ON
Station_Id	10580	10581	15343
NO2+NO3-N (mg/L)			
Screening Level	≤ 3.5	≤ 3.5	≤ 3.5
Maximum	-	0.24	0.17
Minimum	-	0.01	0.01
Mean	-	0.05	0.06
No. Samples	No Data	33	34
% exceedance	-	0%	0%
Assessment	-	No Concern	No Concern
NH3-N (mg/L)			
Screening Level	≤ 0.16	≤ 0.16	≤ 0.16
Maximum	0.03	0.34	0.16
Minimum	0.03	0.01	0.01
Mean	0.03	0.05	0.06
No. Samples	19	34	35
% exceedance	0%	3%	0%
Assessment	No Concern	No Concern	No Concern
Total PO4 (mg/L)			
Screening Level	≤ 1.10	≤ 1.10	≤ 1.10
Maximum	0.14	0.33	0.51
Minimum	0.02	0.04	0.01
Mean	0.08	0.10	0.11
No. Samples	19	33	34
% exceedance	0%	0%	0%
Assessment	No Concern	No Concern	No Concern
Chlorophyll α (µg/L)			
Screening Level	≤ 13.7	≤ 13.7	≤ 13.7
Maximum	17.5	-	-
Minimum	0.5	-	-
Mean	5.0	-	-
No. Samples	18	No Data	No Data
% exceedance	6%	-	-
Assessment	No Concern	-	-

Use Support Criteria

Segment	602	602	602
Waterbody / Station Description	Neches Rv. @ US 96	Neches Rv. @ FM1013	Neches Rv near Lakeview
On/Off Segment	ON	ON	ON
Station_Id	10580	10581	15343
Dissolved Oxygen (mg/L)			
Screening Level	≥ 5	≥ 5	≥ 5
Maximum	10.9	11.2	11.1
Minimum	6.1	5.4	6.3
Mean	7.9	7.9	8.1
No. Samples	21	34	35
% exceedance	0%	0%	0%
Assessment	Full Support	Full Support	Full Support
Fecal Coliform (#/100mL)			
Screening Level	≤ 400	≤ 400	≤ 400
Maximum	670	1,000	1,200
Minimum	3	<2	2
Mean	73	79	73
No. Samples	18	33	34
% exceedance	6%	3%	3%
Assessment	Full Support	Full Support	Full Support

General Use Support Criteria

Segment	602	602	602
Waterbody / Station Description	Neches R. @ US 96	NR @ 1013	NR _ LKVW
On/Off Segment	ON	ON	ON
Station_Id	10580	10581	15343
pH (std. units)			
Screening Level	6.0 - 8.5	6.0 - 8.5	6.0 - 8.5
Maximum	7.8	7.6	7.4
Minimum	6.5	6.2	5.9
Mean	7.1	6.8	6.8
No. Samples	21	33	35
% exceedance	0%	0%	3%
Assessment	Full Support	Full Support	Full Support
Water Temperature (ºC)			
Screening Level	≤ 33	≤ 33	≤ 33
Maximum	31.7	31.3	31.9
Minimum	9.2	10.5	6.8
Mean	22.5	21.7	21.2
No. Samples	21	29	29
% exceedance	0%	0%	0%
Assessment	Full Support	Full Support	Full Support
Chloride (mg/L)	*(Average value must not exceed Screening Level).*		
Screening Level	≤ 50	≤ 50	≤ 50
Mean	16	16	16
No. Samples	19	34	35
Use Support	Yes	Yes	Yes
Sulfate (mg/L)	*(Average value must not exceed Screening Level).*		
Screening Level	≤ 50	≤ 50	≤ 50
Mean	18	17	16
No. Samples	19	5	7
Use Support	Yes	Yes	Yes
Total Dissolved Solids (mg/L)	*(Average value must not exceed Screening Level).*		
Screening Level	≤ 200	≤ 200	≤ 200
Mean	124	88	89
No. Samples	19	34	35
Use Support	Yes	Yes	Yes

Segment 0602 – Neches River below B. A. Steinhagen Lake - Metals Data

Segment	***602***	***602***	***602***
Waterbody	Neches River @ FM 1013	Neches River near Lakeview	Neches River @ US 96
On/Off Segment	On	On	On
Station_Id	10581	15343	10580
Aluminum (AWRL = 200 ppb)			
Chronic Screening Level	NA	NA	NA
Support (Y/N)	NA	NA	NA
Acute Screening Level	991	991	991
% exceeeds acute criteria	13%	0%	0%
No. Samples	8	8	16
Support (Y/N)	N	Y	Y
Arsenic (AWRL = 5 ppb)			
Chronic Screening Level	190	190	190
Support (Y/N)	Y	Y	Y
Acute Screening Level	360	360	360
% exceeeds acute criteria	0%	0%	0%
No. Samples	9	9	14
Support (Y/N)	Y	Y	Y
Cadmium (AWRL = 0.1ppb)			
Chronic Screening Level	0.51	0.51	0.51
Support (Y/N)	Y	Y	Y
Acute Screening Level	8.02	8.02	8.02
% exceeeds acute criteria	0%	0%	0%
No. Samples	8	8	16
Support (Y/N)	Y	Y	Y
Chromium (AWRL = 10 ppb)			
Chronic Screening Level	73	73	73
Support (Y/N)	Y	Y	Y
Acute Screening Level	612	612	612
% exceeeds acute criteria	0%	0%	0%
No. Samples	9	9	15
Support (Y/N)	Y	Y	Y
Copper (AWRL =1.0 ppb)			
Chronic Screening Level	4.31	4.31	4.31
Support (Y/N)	Y	Y	Y
Acute Screening Level	5.78	5.78	5.78
% exceeeds acute criteria	0%	0%	0%
No. Samples	8	8	16

Support (Y/N)	Y	Y	Y

Segment	***602***	***602***	***602***
Waterbody	Neches River @ FM 1013	Neches River near Lakeview	Neches River @ US 96
On/Off Segment	On	On	On
Station_Id	10581	15343	10580

Lead (AWRL = 0.1 ppb)			
Chronic Screening Level	0.63	0.63	0.63
Support (Y/N)	Y	Y	Y
Acute Screening Level	16.15	16.15	16.15
% exceeeds acute criteria	0%	0%	0%
No. Samples	8	8	15
Support (Y/N)	Y	Y	Y

Nickel (AWRL = 10 ppb)			
Chronic Screening Level	54	54	54
Support (Y/N)	Y	Y	Y
Acute Screening Level	483	483	483
% exceeeds acute criteria	0%	0%	0%
No. Samples	9	9	16
Support (Y/N)	Y	Y	Y

Selenium (AWRL = 2 ppb)			
Chronic Screening Level	5	5	5
Support (Y/N)	Y	Y	Y
Acute Screening Level	20	20	20
% exceeeds acute criteria	0%	0%	0%
No. Samples	9	9	14
Support (Y/N)	Y	Y	Y

Silver (AWRL = 0.5 ppb)			
Chronic Screening Level	Not Applicable	Not Applicable	Not Applicable
Support (Y/N)	-	-	-
Acute Screening Level	0.92	0.92	0.92
% exceeeds acute criteria	0%	0%	0%
No. Samples	9	9	16
Support (Y/N)	Y	Y	Y

Zinc (AWRL = 5 ppb)			
Chronic Screening Level	36.05	36.05	36.05
Support (Y/N)	Y	Y	Y
Acute Screening Level	39.8	39.8	39.8
% exceeeds acute criteria	0%	0%	0%
No. Samples	8	8	16

Support (Y/N)	Y	Y	Y

Segment 0603 – B. A. Steinhagen Lake
Conventional Parameters

Nutrient Impact

Segment	603	603	603
Waterbody / Station Description	B.A. Steinhagen Lake near dam	Sandy Cr. at FM 777	Wolf Cr. at SH 256
On/Off Segment	ON	OFF	OFF
Station_Id	10582	10484	15344
NO2+NO3-N (mg/L)			
Screening Level	≤ 0.34	≤ 3.5	≤ 3.5
Maximum	-	1.30	0.24
Minimum	-	0.02	0.01
Mean	-	0.58	0.10
No. Samples	No Data	33	33
% exceedance	-	0%	0%
Assessment	-	No Concern	No Concern
NH3-N (mg/L)			
Screening Level	≤ 0.12	≤ 0.16	≤ 0.16
Maximum	0.40	0.18	0.22
Minimum	0.03	0.01	0.01
Mean	0.06	0.06	0.05
No. Samples	12	34	34
% exceedance	8%	9%	3%
Assessment	No Concern	No Concern	No Concern
Total PO4 (mg/L)			
Screening Level	≤ 0.24	≤ 1.10	≤ 1.10
Maximum	0.16	0.45	0.27
Minimum	0.03	0.05	0.02
Mean	0.08	0.20	0.06
No. Samples	13	33	33
% exceedance	0%	0%	0%
Assessment	No Concern	No Concern	No Concern
Chlorophyll α (µg/L)			
Screening Level	≤ 22.3	≤ 13.7	≤ 13.7
Maximum	17.6	-	-
Minimum	0.5	-	-
Mean	4.2	-	-
No. Samples	13	No Data	No Data
% exceedance	0%	-	-
Assessment	No Concern	-	-

Use Support Criteria

Segment	603	603	603
Waterbody / Station Description	B.A. Steinhagen Lake near dam	Sandy Cr. at FM 777	Wolf Cr. at SH 256
On/Off Segment	ON	OFF	OFF
Station_Id	10582	10484	15344
Dissolved Oxygen (mg/L)			
Screening Level	≥ 5	≥ 5	≥ 5
Maximum	11.7	10.0	10.7
Minimum	4.3	6.3	6.6
Mean	8.6	7.9	8.2
No. Samples	14.0	34	34
% exceedance	7%	0%	0%
Assessment	Full Support	Full Support	Full Support
Fecal Coliform (#/100mL)			
Screening Level	≤ 400	≤ 400	≤ 400
Maximum	550	3,820	2,213
Minimum	2	13	10
Mean	67	429	331
No. Samples	13	34	33
% exceedance	8%	26%	21%
Assessment	Full Support	Not Supported	Full Support

General Use Support Criteria

Segment	603	603	603
Waterbody / Station Description	B.A. Steinhagen Lake near dam	Sandy Cr. at FM 777	Wolf Cr. at SH 256
On/Off Segment	ON	OFF	OFF
Station_Id	10582	10484	15344
pH (std. units)			
Screening Level	6.0 - 8.5	6.0 - 8.5	6.0 - 8.5
Maximum	8.0	7.0	7.5
Minimum	6.2	6.0	6.0
Mean	7.2	6.3	6.5
No. Samples	11.0	34	34
% exceedance	0%	0%	3%
Assessment	Full Support	Full Support	Full Support
Water Temperature (ºC)			
Screening Level	≤ 34	≤ 34	≤ 34
Maximum	33.0	25.4	26.7
Minimum	8.1	10.2	9.3
Mean	20.0	19.4	19.7
No. Samples	14.0	29	29
% exceedance	0%	0%	0%
Assessment	Full Support	Full Support	Full Support
Chloride (mg/L)	*(Average value must not exceed Screening Level).*		
Screening Level	≤ 50	Not Applicable	Not Applicable
Mean	17	-	-
No. Samples	14	-	-
Use Support	Yes	-	-
Sulfate (mg/L)	*(Average value must not exceed Screening Level).*		
Screening Level	≤ 50	Not Applicable	Not Applicable
Mean	18	-	-
No. Samples	14	-	-
Use Support	Yes	-	-
Total Dissolved Solids (mg/L)	*(Average value must not exceed Screening Level).*		
Screening Level	≤ 200	Not Applicable	Not Applicable
Mean	126	-	-
No. Samples	14	-	-
Use Support	Yes	-	-

Segment 0603 – B. A. Steinhagen Lake - Metals Data

Segment	***603***	***603***
Waterbody	Sandy Cr. @ FM 777	Wolf Cr. @ SH 256
On/Off Segment	Off	Off
Station_Id	10484	15344

Aluminum (AWRL = 200 ppb)		
Chronic Screening Level	NA	NA
Support (Y/N)	NA	NA
Acute Screening Level	991	991
% exceeeds acute criteria	0%	0%
No. Samples	8	8
Support (Y/N)	Y	Y

Arsenic (AWRL = 5 ppb)		
Chronic Screening Level	190	190
Support (Y/N)	Y	Y
Acute Screening Level	360	360
% exceeeds acute criteria	0%	0%
No. Samples	9	9
Support (Y/N)	Y	Y

Cadmium (AWRL = 0.1ppb)		
Chronic Screening Level	0.51	0.51
Support (Y/N)	Y	Y
Acute Screening Level	8.02	8.02
% exceeeds acute criteria	0%	0%
No. Samples	8	8
Support (Y/N)	Y	Y

Chromium (AWRL = 10 ppb)		
Chronic Screening Level	73	73
Support (Y/N)	Y	Y
Acute Screening Level	612	612
% exceeeds acute criteria	0%	0%
No. Samples	9	9
Support (Y/N)	Y	Y

Copper (AWRL =1.0 ppb)		
Chronic Screening Level	4.31	4.31
Support (Y/N)	Y	Y
Acute Screening Level	5.78	5.78
% exceeeds acute criteria	0%	0%
No. Samples	8	8

Support (Y/N)	Y	Y

Segment	***603***	***603***
Waterbody	Sandy Cr. @ FM 777	Wolf Cr. @ SH 256
On/Off Segment	Off	Off
Station_Id	10484	15344

Lead (AWRL = 0.1 ppb)		
Chronic Screening Level	0.63	0.63
Support (Y/N)	Y	Y
Acute Screening Level	16.15	16.15
% exceeeds acute criteria	0%	0%
No. Samples	8	8
Support (Y/N)	Y	Y

Nickel (AWRL = 10 ppb)		
Chronic Screening Level	54	54
Support (Y/N)	Y	Y
Acute Screening Level	483	483
% exceeeds acute criteria	0%	0%
No. Samples	9	9
Support (Y/N)	Y	Y

Selenium (AWRL = 2 ppb)		
Chronic Screening Level	5	5
Support (Y/N)	Y	Y
Acute Screening Level	20	20
% exceeeds acute criteria	0%	0%
No. Samples	9	9
Support (Y/N)	Y	Y

Silver (AWRL = 0.5 ppb)		
Chronic Screening Level	Not Applicable	Not Applicable
Support (Y/N)	-	-
Acute Screening Level	0.92	0.92
% exceeeds acute criteria	0%	0%
No. Samples	9	9
Support (Y/N)	Y	Y

Zinc (AWRL = 5 ppb)		
Chronic Screening Level	36.05	36.05
Support (Y/N)	Y	Y
Acute Screening Level	39.8	39.8
% exceeeds acute criteria	0%	0%
No. Samples	8	8
Support (Y/N)	Y	Y

Segment 0607 – Pine Island Bayou
Conventional Parameters

Nutrient Impact

Segment	607	607	607	607	607	607
Waterbody / Station Description	Pine Is. Bayou @ 770	Willow Cr. @ unnamed road	Pine Is. Bayou @ Sour Lake Rd.	Lil' Pine Is. Bayou @ SH 326	Pine Is. Bayou @ US 69	Pine Is. Bayou @ LNVA #1
On/Off Segment	On	Off	On	Off	On	On
Station_Id	15367	15345	10607	15346	10602	10599
NO2+NO3-N (mg/L)						
Screening Level	≤ 3.5	≤ 3.5	≤ 3.5	≤ 3.5	≤ 3.5	≤ 3.5
Maximum	0.27	1.58	0.93	0.47	0.35	0.18
Minimum	0.01	0.01	0.01	0.01	0.02	0.01
Mean	0.08	0.20	0.19	0.10	0.08	0.07
No. Samples	35	35	35	35	19	35
% exceedance	0%	0%	0%	0%	0%	0%
Assessment	No Concern	No Concern	No Concern	No Concern	No Concern	No Concern
NH3-N (mg/L)						
Screening Level	≤ 0.16	≤ 0.16	≤ 0.16	≤ 0.16	≤ 0.16	≤ 0.16
Maximum	0.32	1.69	1.30	0.82	1.04	0.97
Minimum	0.01	0.02	0.02	0.01	0.03	0.01
Mean	0.10	0.12	0.14	0.12	0.20	0.11
No. Samples	35	35	35	35	19	35
% exceedance	14%	6%	11%	14%	26%	11%
Assessment	No Concern	No Concern	No Concern	No Concern	Concern	No Concern
Total PO4 (mg/L)						
Screening Level	≤ 1.10	≤ 1.10	≤ 1.10	≤ 1.10	≤ 1.10	≤ 1.10
Maximum	0.63	1.23	0.86	0.39	0.35	0.53
Minimum	0.01	0.04	0.02	0.01	0.05	0.02
Mean	0.06	0.15	0.12	0.08	0.12	0.11
No. Samples	35	35	35	35	19	35
% exceedance	0%	3%	0%	0%	0%	0%
Assessment	No Concern	No Concern	No Concern	No Concern	No Concern	No Concern
Chlorophyll α (µg/L)						
Screening Level	≤ 13.7	≤ 13.7	≤ 13.7	≤ 13.7	≤ 13.7	≤ 13.7
Maximum	-	-	-	-	-	-
Minimum	-	-	-	-	-	-
Mean	-	-	-	-	-	-
No. Samples	No Data	No Data	No Data	No Data	No Data	No Data
% exceedance	-	-	-	-	-	-
Assessment	-	-	-	-	-	-

Use Support Criteria

Segment	607	607	607	607	607	607
Waterbody / Station Description	Pine Is. Bayou @ 770	Willow Cr. @ unnamed road	Pine Is. Bayou @ Sour Lake Rd.	Lil' Pine Is. Bayou @ SH 326	Pine Is. Bayou @ US 69	Pine Is. Bayou @ LNVA #1
On/Off Segment	On	Off	On	Off	On	On
Station_Id	15367	15345	10607	15346	10602	10599
Dissolved Oxygen (mg/L)						
Screening Level	≥ 5	≥ 5	≥ 5	≥ 5	≥ 5	≥ 5
Maximum	11.1	10.3	9.4	9.2	12.3	9.2
Minimum	1.5	0.8	3.2	0.9	2.9	0.8
Mean	5.2	5.3	5.9	5.1	6.7	6.2
No. Samples	35	36	35	35	25	33
% exceedance	46%	36%	31%	51%	16%	15%
Assessment	Not Supported	Not Supported	Not Supported	Not Supported	Partial Support	Partial Support
Fecal Coliform (#/100mL)						
Screening Level	≤ 400	≤ 400	≤ 400	≤ 400	≤ 400	≤ 400
Maximum	3,860	2,440	4,420	3,180	782	1,060
Minimum	3	7	19	4	3	1
Mean	290	281	358	280	67	121
No. Samples	35	35	35	35	19	35
% exceedance	14%	17%	20%	14%	5%	9%
Assessment	Full Support	Full Support	Full Support	Full Support	Full Support	Full Support

General Use Support Criteria

Segment	607	607	607	607	607	607
Waterbody / Station Description	Pine Is. Bayou @ 770	Willow Cr. @ unnamed road	Pine Is. Bayou @ Sour Lake Rd.	Lil' Pine Is. Bayou @ SH 326	Pine Is. Bayou @ US 69	Pine Is. Bayou @ LNVA #1
On/Off Segment	On	Off	On	Off	On	On
Station_Id	15367	15345	10607	15346	10602	10599
pH (std. units)						
Screening Level	6.0 - 8.5	Not Applicable	6.0 - 8.5	Not Applicable	6.0 - 8.5	6.0 - 8.5
Maximum	7.3	-	7.2	-	8.5	7.5
Minimum	5.3	-	5.4	-	6.1	5.2
Mean	6.5	-	6.6	-	6.8	6.6
No. Samples	39.0	-	39.0	-	25.0	34.0
% exceedance	10%	-	8%	-	0%	6%
Assessment	Full Support	-	Full Support	-	Full Support	Full Support
Water Temperature (ºC)						
Screening Level	≤ 35	Not Applicable	≤ 35	Not Applicable	≤ 35	≤ 35
Maximum	30.6	-	29.9	-	32.1	32.1
Minimum	7.8	-	8.1	-	7.2	7.3
Mean	19.1	-	19.9	-	21.1	21.1
No. Samples	30	-	30	-	19	30
% exceedance	0%	-	0%	-	0%	0%
Assessment	Full Support	-	Full Support	-	Full Support	Full Support
Chloride (mg/L)	*(Average value must not exceed Screening Level).*					
Screening Level	≤ 150	Not Applicable	≤ 150	Not Applicable	≤ 150	≤ 150
Mean	28	-	32	-	23	18
No. Samples	35	-	35	-	19	35
Use Support	YES	-	YES	-	YES	YES
Sulfate (mg/L)	*(Average value must not exceed Screening Level).*					
Screening Level	≤ 50	Not Applicable	≤ 50	Not Applicable	≤ 50	≤ 50
Mean	5	-	7	-	6	11
No. Samples	7	-	7	-	7	7
Use Support	YES	-	YES	-	YES	YES
Total Dissolved Solids (mg/L)	*(Average value must not exceed Screening Level).*					
Screening Level	≤ 300	Not Applicable	≤ 300	Not Applicable	≤ 300	≤ 300
Mean	110	-	121	-	101	91
No. Samples	49	-	39	-	25	35
Use Support	YES	-	YES	-	YES	YES

Segment 0607 – Pine Island Bayou - Metals Data

Segment	***607***	***607***	***607***	***607***	***607***	***607***
Waterbody	PIB @ 770	Willow Cr.	PIB@SLR	Lil PIB@326	PIB@69	PIB@LNVA1
On/Off Segment	On	Off	On	Off	On	On
Station_Id	15367	15345	10607	15346	10602	10599
Aluminum (AWRL = 200 ppb)						
Chronic Screening Level	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Support (Y/N)	-	-	-	-	-	-
Acute Screening Level	991	991	991	991	991	991
% exceeeds acute criteria	33%	22%	33%	22%	33%	11%
No. Samples	9	9	9	9	6	9
Support (Y/N)	N	N	N	N	N	N
Arsenic (AWRL = 5 ppb)						
Chronic Screening Level	190	190	190	190	190	190
Support (Y/N)	Y	Y	Y	Y	Y	Y
Acute Screening Level	360	360	360	360	360	360
% exceeeds acute criteria	0%	0%	0%	0%	0%	0%
No. Samples	9	9	9	9	6	9
Support (Y/N)	Y	Y	Y	Y	Y	Y
Cadmium (AWRL = 0.1ppb)						
Chronic Screening Level	0.51	0.51	0.51	0.51	0.51	0.51
Support (Y/N)	Y	Y	N	Y	N	Y
Acute Screening Level	8.02	8.02	8.02	8.02	8.02	8.02
% exceeeds acute criteria	0%	0%	0%	0%	0%	0%
No. Samples	8	8	8	8	5	8
Support (Y/N)	Y	Y	Y	Y	Y	Y
Chromium (AWRL = 10 ppb)						
Chronic Screening Level	73	73	73	73	73	73
Support (Y/N)	Y	Y	Y	Y	Y	Y
Acute Screening Level	612	612	612	612	612	612
% exceeeds acute criteria	0%	0%	0%	0%	0%	0%
No. Samples	9	9	9	9	6	9
Support (Y/N)	Y	Y	Y	Y	Y	Y
Copper (AWRL =1.0 ppb)						
Chronic Screening Level	4.31	4.31	4.31	4.31	4.31	4.31
Support (Y/N)	Y	Y	Y	Y	Y	Y
Acute Screening Level	5.78	5.78	5.78	5.78	5.78	5.78
% exceeeds acute criteria	0%	0%	0%	0%	0%	0%
No. Samples	8	8	8	8	5	8

Support (Y/N)	Y	Y	Y	Y	Y	Y

Segment	***607***	***607***	***607***	***607***	***607***	***607***
Waterbody	PIB @ 770	Willow Cr.	PIB@SLR	Lil PIB@326	PIB@69	PIB@LNVA1
On/Off Segment	On	Off	On	Off	On	On
Station_Id	15367	15345	10607	15346	10602	10599
Lead (AWRL = 0.1 ppb)						
Chronic Screening Level	0.63	0.63	0.63	0.63	0.63	0.63
Support (Y/N)	N	N	N	N	N	Y
Acute Screening Level	16.15	16.15	16.15	16.15	16.15	16.15
% exceeeds acute criteria	0%	0%	0%	0%	0%	0%
No. Samples	8	8	8	8	5	8
Support (Y/N)	Y	Y	Y	Y	Y	Y
Nickel (AWRL = 10 ppb)						
Chronic Screening Level	54	54	54	54	54	54
Support (Y/N)	Y	Y	Y	Y	Y	Y
Acute Screening Level	483	483	483	483	483	483
% exceeeds acute criteria	0%	0%	0%	0%	0%	0%
No. Samples	9	9	9	9	6	9
Support (Y/N)	Y	Y	Y	Y	Y	Y
Selenium (AWRL = 2 ppb)						
Chronic Screening Level	5	5	5	5	5	5
Support (Y/N)	Y	Y	Y	Y	Y	Y
Acute Screening Level	20	20	20	20	20	20
% exceeeds acute criteria	0%	0%	0%	0%	0%	0%
No. Samples	9	9	9	9	6	9
Support (Y/N)	Y	Y	Y	Y	Y	Y
Silver (AWRL = 0.5 ppb)						
Chronic Screening Level	NA	NA	NA	NA	NA	NA
Support (Y/N)	NA	NA	NA	NA	NA	NA
Acute Screening Level	0.92	0.92	0.92	0.92	0.92	0.92
% exceeeds acute criteria	0%	0%	0%	0%	0%	0%
No. Samples	9	9	9	9	6	9
Support (Y/N)	Y	Y	Y	Y	Y	Y
Zinc (AWRL = 5 ppb)						
Chronic Screening Level	36.05	36.05	36.05	36.05	36.05	36.05
Support (Y/N)	Y	Y	Y	Y	Y	Y
Acute Screening Level	39.8	39.8	39.8	39.8	39.8	39.8
% exceeeds acute criteria	0%	0%	13%	0%	20%	0%
No. Samples	8	8	8	8	5	8
Support (Y/N)	Y	Y	N	Y	N	Y

Segment 0608 – Village Creek
Conventional Parameters

Nutrient Impact

Segment	608	608	608	608	608	608	608
Waterbody / Station Description	Big Sandy Cr. @ US 190	Turkey Cr. @ FM 1013	Beech Cr. @ FM 1943	Hickory Cr. @ US 69	Village Cr. @ FM 418	Village Cr. @ US 96	Cypress Cr. @ US 69
On/Off Segment	OFF	OFF	OFF	OFF	ON	ON	OFF
Station_Id	15353	15356	15355	15349	13625	10609	15352
NO2+NO3-N (mg/L)							
Screening Level	≤ 3.5	≤ 3.5	≤ 3.5	≤ 3.5	≤ 3.5	≤ 3.5	≤ 3.5
Maximum	0.81	1.31	0.16	0.17	0.26	-	0.23
Minimum	0.02	0.01	0.01	0.01	0.01	-	0.01
Mean	0.34	0.35	0.04	0.06	0.08	-	0.05
No. Samples	33	33	33	33	33	No Data	33
% exceedance	0%	0%	0%	0%	0%	-	0%
Assessment	No Concern	No Concern	No Concern	No Concern	No Concern	-	No Concern
NH3-N (mg/L)							
Screening Level	≤ 0.16	≤ 0.16	≤ 0.16	≤ 0.16	≤ 0.16	≤ 0.16	≤ 0.16
Maximum	0.15	0.27	0.09	0.16	0.20	0.03	0.44
Minimum	0.01	0.01	0.01	0.01	0.01	0.03	0.01
Mean	0.05	0.07	0.04	0.05	0.05	0.03	0.12
No. Samples	34	34	34	34	34	11	34
% exceedance	0%	6%	0%	0%	3%	0%	24%
Assessment	No Concern	No Concern	No Concern	No Concern	No Concern	No Concern	No Concern
Total PO4 (mg/L)							
Screening Level	≤ 1.10	≤ 1.10	≤ 1.10	≤ 1.10	≤ 1.10	≤ 1.10	≤ 1.10
Maximum	0.36	0.41	0.11	0.20	0.21	0.07	0.72
Minimum	0.02	0.05	0.01	0.02	0.02	0.03	0.04
Mean	0.08	0.13	0.04	0.05	0.06	0.04	0.10
No. Samples	33	33	33	33	33	11	33
% exceedance	0%	0%	0%	0%	0%	0%	0%
Assessment	No Concern	No Concern	No Concern	No Concern	No Concern	No Concern	No Concern
Chlorophyll α (µg/L)							
Screening Level	≤ 13.7	≤ 13.7	≤ 13.7	≤ 13.7	≤ 13.7	≤ 13.7	≤ 13.7
Maximum	-	-	-	-	-	7.0	-
Minimum	-	-	-	-	-	0.5	-
Mean	-	-	-	-	-	2.4	-
No. Samples	No Data	No Data	No Data	No Data	No Data	11	No Data
% exceedance	-	-	-	-	-	0%	-
Assessment	-	-	-	-	-	No Concern	-

Use Support Criteria

Segment	608	608	608	608	608	608	608
Waterbody / Station Description	Big Sandy Cr. @ USs 190	Turkey Cr. @ FM 1013	Beech Cr. @ FM 1943	Hickory Cr. @ US 69	Village Cr. @ FM 418	Village Cr. @ US 96	Cypress Cr. @ US 69
On/Off Segment	OFF	OFF	OFF	OFF	ON	ON	OFF
Station_Id	15353	15356	15355	15349	13625	10609	15352
Dissolved Oxygen (mg/L)							
Screening Level	≥ 5	≥ 5	≥ 5	≥ 5	≥ 5	≥ 5	≥ 5
Maximum	11.6	11.1	9.9	10.7	10.3	10.4	11.3
Minimum	4.6	6.4	3.3	6.3	5.9	6.7	0.7
Mean	7.9	8.1	6.7	8.1	7.7	8.42	5.0
No. Samples	34	34	34	34	34	15	34
% exceedance	3%	0%	21%	0%	0%	0%	47%
Assessment	Full Support	Full Support	Not Supported	Full Support	Full Support	Full Support	Not Supported
Fecal Coliform (#/100mL)							
Screening Level	≤ 400	≤ 400	≤ 400	≤ 400	≤ 400	≤ 400	≤ 400
Maximum	6,900	2,900	1,900	1,619	1,344	317	3,900
Minimum	<2	<2	3	<2	<2	10	2
Mean	692	468	197	204	209	75	505
No. Samples	57	43	34	57	33	10	44
% exceedance	26%	30%	9%	12%	18%	0%	23%
Assessment	Not Supported	Not Supported	Full Support	Full Support	Full Support	Full Support	Full Support

General Use Support Criteria

Segment	608	608	608	608	608	608	608
Waterbody / Station Description	Big Sandy Cr. @ USs 190	Turkey Cr. @ FM 1013	Beech Cr. @ FM 1943	Hickory Cr. @ US 69	Village Cr. @ FM 418	Village Cr. @ US 96	Cypress Cr. @ US 69
On/Off Segment	OFF	OFF	OFF	OFF	ON	ON	OFF
Station_Id	15353	15356	15355	15349	13625	10609	15352
pH (std. units)							
Screening Level	Not Applicable	Not Applicable	Not Applicable	Not Applicable	6.0 - 8.5	6.0 - 8.5	Not Applicable
Maximum	-	-	-	-	6.8	7.2	-
Minimum	-	-	-	-	4.8	5.6	-
Mean	-	-	-	-	6.1	6.6	-
No. Samples	-	-	-	-	33.0	15	-
% exceedance	-	-	-	-	24%	13%	-
Assessment	-	-	-	-	Partial Support	Partial Support	-
Water Temperature (ºC)							
Screening Level	≤ 32	≤ 32	≤ 32	≤ 32	≤ 32	≤ 32	≤ 32
Maximum	26.4	27.3	28.2	27.7	30.5	31.5	28.2
Minimum	8.5	8.2	7.4	9.2	10.1	7.7	7.9
Mean	18.9	19.4	19.5	19.4	20.7	20.0	19.6
No. Samples	50	34	34	52	34	15	45
% exceedance	0%	0%	0%	0%	0%	0%	0%
Assessment	Full Support	Full Support	Full Support	Full Support	Full Support	Full Support	Full Support
Chloride (mg/L)	*(Average value must not exceed Screening Level).*						
Screening Level	Not Applicable	Not Applicable	Not Applicable	Not Applicable	≤ 150	≤ 150	Not Applicable
Mean	-	-	-	-	11	15	-
No. Samples	-	-	-	-	34	11	-
Supports Use	-	-	-	-	Yes	Yes	-
Sulfate (mg/L)	*(Average value must not exceed Screening Level).*						
Screening Level	Not Applicable	Not Applicable	Not Applicable	Not Applicable	≤ 75	≤ 75	Not Applicable
Mean	-	-	-	-	5	3	-
No. Samples	-	-	-	-	5	3	-
Supports Use	-	-	-	-	Yes	Yes	-
Total Dissolved Solids (mg/L)	*(Average value must not exceed Screening Level).*						
Screening Level	Not Applicable	Not Applicable	Not Applicable	Not Applicable	≤ 300	≤ 300	Not Applicable
Mean	-	-	-	-	46	78	-
No. Samples	-	-	-	-	34	78	-
Supports Use	-	-	-	-	Yes	Yes	-

Segment 0608 – Village Creek - Metals Data

Segment	608	608	608	608	608	608	608
Waterbody	Big Sandy Cr. @ US 190	Turkey Cr. @ FM 1013	Beech Cr. @ FM 1943	Hickory Cr. @ US 69	Village Cr. @ FM 418	Cypress Cr. @ US 69	Village Cr. @ US 96
On/Off Segment	Off	Off	Off	Off	On	Off	On
Station_Id	15353	15356	15355	15349	13625	15352	10609
Aluminum (AWRL = 200 ppb)							
Chronic Screening Level	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Support (Y/N)	-	-	-	-	-	-	-
Acute Screening Level	991	991	991	991	991	991	991
% exceeeds acute criteria	0%	0%	0%	13%	13%	25%	0%
No. Samples	8	8	8	8	8	8	9
Support (Y/N)	Y	Y	Y	N	N	N	Y
Arsenic (AWRL = 5 ppb)							
Chronic Screening Level	190	190	190	190	190	190	190
Support (Y/N)	Y	Y	Y	Y	Y	Y	Y
Acute Screening Level	360	360	360	360	360	360	360
% exceeeds acute criteria	0%	0%	0%	0%	0%	0%	0%
No. Samples	9	9	9	9	9	9	9
Support (Y/N)	Y	Y	Y	Y	Y	Y	Y
Cadmium (AWRL = 0.1ppb)							
Chronic Screening Level	0.51	0.51	0.51	0.51	0.51	0.51	0.51
Support (Y/N)	N	Y	Y	Y	Y	N	Y
Acute Screening Level	8.02	8.02	8.02	8.02	8.02	8.02	8.02
% exceeeds acute criteria	0%	0%	0%	0%	0%	0%	0%
No. Samples	8	8	8	8	8	8	9
Support (Y/N)	Y	Y	Y	Y	Y	Y	Y
Chromium (AWRL = 10 ppb)							
Chronic Screening Level	73	73	73	73	73	73	73
Support (Y/N)	Y	Y	Y	Y	Y	Y	Y
Acute Screening Level	612	612	612	612	612	612	612
% exceeeds acute criteria	0%	0%	0%	0%	0%	0%	0%
No. Samples	9	9	9	9	9	9	9
Support (Y/N)	Y	Y	Y	Y	Y	Y	Y
Copper (AWRL =1.0 ppb)							
Chronic Screening Level	4.31	4.31	4.31	4.31	4.31	4.31	4.31
Support (Y/N)	Y	Y	Y	Y	Y	Y	Y
Acute Screening Level	5.78	5.78	5.78	5.78	5.78	5.78	5.78
% exceeeds acute criteria	0%	0%	0%	0%	0%	0%	0%
No. Samples	8	8	8	8	8	8	9

Support (Y/N)	Y	Y	Y	Y	Y	Y	Y

Segment	***608***	***608***	***608***	***608***	***608***	***608***	***608***
Waterbody	Big Sandy Cr. @ US 190	Turkey Cr. @ FM 1013	Beech Cr. @ FM 1943	Hickory Cr. @ US 69	Village Cr. @ FM 418	Cypress Cr. @ US 69	Village Cr. @ US 96
On/Off Segment	Off	Off	Off	Off	On	Off	On
Station_Id	15353	15356	15355	15349	13625	15352	10609
Lead (AWRL = 0.1 ppb)							
Chronic Screening Level	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Support (Y/N)	Y	Y	Y	Y	Y	N	Y
Acute Screening Level	16.15	16.15	16.15	16.15	16.15	16.15	16.15
% exceeeds acute criteria	0%	0%	0%	0%	0%	0%	0%
No. Samples	8	8	8	8	8	8	9
Support (Y/N)	Y	Y	Y	Y	Y	Y	Y
Nickel (AWRL = 10 ppb)							
Chronic Screening Level	54	54	54	54	54	54	54
Support (Y/N)	Y	Y	Y	Y	Y	Y	Y
Acute Screening Level	483	483	483	483	483	483	483
% exceeeds acute criteria	0%	0%	0%	0%	0%	0%	0%
No. Samples	9	9	9	9	9	9	9
Support (Y/N)	Y	Y	Y	Y	Y	Y	Y
Selenium (AWRL = 2 ppb)							
Chronic Screening Level	5	5	5	5	5	5	5
Support (Y/N)	Y	Y	Y	Y	Y	Y	Y
Acute Screening Level	20	20	20	20	20	20	20
% exceeeds acute criteria	0%	0%	0%	0%	0%	0%	0%
No. Samples	9	9	9	9	9	9	9
Support (Y/N)	Y	Y	Y	Y	Y	Y	Y
Silver (AWRL = 0.5 ppb)							
Chronic Screening Level	NA	NA	NA	NA	NA	NA	NA
Support (Y/N)	NA	NA	NA	NA	NA	NA	NA
Acute Screening Level	0.92	0.92	0.92	0.92	0.92	0.92	0.92
% exceeeds acute criteria	0%	0%	0%	0%	0%	0%	0%
No. Samples	9	9	9	9	9	9	9
Support (Y/N)	Y	Y	Y	Y	Y	Y	Y
Zinc (AWRL = 5 ppb)							
Chronic Screening Level	36.05	36.05	36.05	36.05	36.05	36.05	36.05
Support (Y/N)	Y	Y	Y	Y	Y	Y	Y
Acute Screening Level	39.8	39.8	39.8	39.8	39.8	39.8	39.8
% exceeeds acute criteria	0%	0%	0%	0%	0%	0%	0%
No. Samples	8	8	8	8	8	8	9
Support (Y/N)	Y	Y	Y	Y	Y	Y	Y

Segment 0609 – Angelina River below Sam Rayburn Reservoir
Conventional Parameters

Nutrient Impact

Segment	609
Waterbody / Station Description	Angelina River @ SH 63
On/Off Segment	On
Station_Id	10610
NO2+NO3-N (mg/L)	
Screening Level	≤ 3.5
Maximum	0.18
Minimum	0.01
Mean	0.06
No. Samples	33
% exceedance	0%
Assessment	No Concern
NH3-N (mg/L)	
Screening Level	≤ 0.16
Maximum	0.13
Minimum	0.01
Mean	0.05
No. Samples	34
% exceedance	0%
Assessment	No Concern
Total PO4 (mg/L)	
Screening Level	≤ 1.10
Maximum	0.30
Minimum	0.01
Mean	0.05
No. Samples	33
% exceedance	0%
Assessment	No Concern
Chlorophyll α (µg/L)	
Screening Level	≤ 13.7
Maximum	-
Minimum	-
Mean	-
No. Samples	No Data
% exceedance	-
Assessment	-

Use Support Criteria

Segment	609
Waterbody / Station Description	Angelina River @ SH 63
On/Off Segment	On
Station_Id	10610
Dissolved Oxygen (mg/L)	
Screening Level	≥ 5
Maximum	11.9
Minimum	2.3
Mean	7.5
No. Samples	34
% exceedance	9%
Assessment	Full Support
Fecal Coliform (#/100mL)	
Screening Level	≤ 400
Maximum	2,300
Minimum	<2
Mean	189
No. Samples	34
% exceedance	15%
Assessment	Full Support

General Use Support Criteria

Segment	609
Waterbody / Station Description	Angelina River @ SH 63
On/Off Segment	On
Station_Id	10610
pH (std. units)	
Screening Level	6.0 - 8.5
Maximum	7.8
Minimum	5.5
Mean	6.8
No. Samples	34
% exceedance	6%
Assessment	Full Support
Water Temperature (ºC)	
Screening Level	≤ 32
Maximum	30.0
Minimum	9.2
Mean	20.9
No. Samples	29
% exceedance	0%
Assessment	Full Support
Chloride (mg/L)	*(Average value must not exceed Screening Level).*
Screening Level	≤ 70
Mean	14
No. Samples	34
Use Support	YES
Sulfate (mg/L)	*(Average value must not exceed Screening Level).*
Screening Level	50
Mean	20
No. Samples	5
Use Support	YES
Total Dissolved Solids (mg/L)	*(Average value must not exceed Screening Level).*
Screening Level	≤ 250
Mean	82
No. Samples	34
Use Support	YES

Segment 0609 – Angelina River below Sam Rayburn Reservoir - Metals Data

Segment	***609***
Waterbody	Angelina R. @ SH 63
On/Off Segment	On
Station_Id	10610

Aluminum (AWRL = 200 ppb)	
Chronic Screening Level	NA
Support (Y/N)	NA
Acute Screening Level	991
% exceeeds acute criteria	0%
No. Samples	8
Support (Y/N)	Y

Arsenic (AWRL = 5 ppb)	
Chronic Screening Level	190
Support (Y/N)	Y
Acute Screening Level	360
% exceeeds acute criteria	0%
No. Samples	9
Support (Y/N)	Y

Cadmium (AWRL = 0.1ppb)	
Chronic Screening Level	0.51
Support (Y/N)	Y
Acute Screening Level	8.02
% exceeeds acute criteria	0%
No. Samples	8
Support (Y/N)	Y

Chromium (AWRL = 10 ppb)	
Chronic Screening Level	73
Support (Y/N)	Y
Acute Screening Level	612
% exceeeds acute criteria	0%
No. Samples	9
Support (Y/N)	Y

Copper (AWRL =1.0 ppb)	
Chronic Screening Level	4.31
Support (Y/N)	Y
Acute Screening Level	5.78
% exceeeds acute criteria	0%
No. Samples	8

Support (Y/N)	Y

Segment	***609***
Waterbody	Angelina R. @ SH 63
On/Off Segment	On
Station_Id	10610

Lead (AWRL = 0.1 ppb)	
Chronic Screening Level	0.63
Support (Y/N)	Y
Acute Screening Level	16.15
% exceeeds acute criteria	0%
No. Samples	8
Support (Y/N)	Y

Nickel (AWRL = 10 ppb)	
Chronic Screening Level	54
Support (Y/N)	Y
Acute Screening Level	483
% exceeeds acute criteria	0%
No. Samples	9
Support (Y/N)	Y

Selenium (AWRL = 2 ppb)	
Chronic Screening Level	5
Support (Y/N)	Y
Acute Screening Level	20
% exceeeds acute criteria	0%
No. Samples	9
Support (Y/N)	Y

Silver (AWRL = 0.5 ppb)	
Chronic Screening Level	NA
Support (Y/N)	NA
Acute Screening Level	0.92
% exceeeds acute criteria	0%
No. Samples	9
Support (Y/N)	Y

Zinc (AWRL = 5 ppb)	
Chronic Screening Level	36.05
Support (Y/N)	Y
Acute Screening Level	39.8
% exceeeds acute criteria	0%
No. Samples	8
Support (Y/N)	Y

Appendix D

Data Screening Results

Neches-Trinity Coastal Basin

Segment 0701 – Taylor Bayou above Tidal
Conventional Parameters

Nutrient Impact

Segment	701	701
Waterbody / Station Description	Taylor Bayou @ SH 73	Taylor Bayou @ LaBelle Rd.
On/Off Segment	ON	ON
Station_Id	10668	10669
NO2+NO3-N (mg/L)		
Screening Level	≤ 3.5	≤ 3.5
Maximum	-	0.78
Minimum	-	0.01
Mean	-	0.17
No. Samples	No Data	35
% exceedance	-	0%
Assessment	-	No Concern
NH3-N (mg/L)		
Screening Level	≤ 0.16	≤ 0.16
Maximum	0.28	0.61
Minimum	0.05	0.01
Mean	0.08	0.13
No. Samples	18	35
% exceedance	6%	11%
Assessment	No Concern	No Concern
Total PO4 (mg/L)		
Screening Level	≤ 1.10	≤ 1.10
Maximum	0.35	0.92
Minimum	0.08	0.05
Mean	0.17	0.17
No. Samples	18.00	35
% exceedance	0%	3%
Assessment	No Concern	No Concern
Chlorophyll α (µg/L)		
Screening Level	≤ 13.7	≤ 13.7
Maximum	32.9	-
Minimum	0.5	-
Mean	8.8	-
No. Samples	18	No data
% exceedance	28%	-
Assessment	Concern	-

Use Support Criteria

Segment	701	701
Waterbody / Station Description	Taylor Bayou @ SH 73	Taylor Bayou @ LaBelle Rd.
On/Off Segment	ON	ON
Station_Id	10668	10669
Dissolved Oxygen (mg/L)		
Screening Level	≥ 4	≥ 4
Maximum	14.3	9.7
Minimum	0.5	2.4
Mean	6.65	5.8
No. Samples	16	35
% exceedance	19%	17%
Assessment	Partial Support	Partial Support
Fecal Coliform (#/100mL)		
Screening Level	≤ 400	≤ 400
Maximum	1530	2,900
Minimum	3	1
Mean	153	257
No. Samples	17	35
% exceedance	6%	14%
Assessment	Full Support	Full Support

General Use Support Criteria

Segment	701	701
Waterbody / Station Description	Taylor Bayou @ SH 73	Taylor Bayou @ LaBelle Rd.
On/Off Segment	ON	ON
Station_Id	10668	10669
pH (std. units)		
Screening Level	6.0 - 9.0	6.0 - 9.0
Maximum	8.5	8.1
Minimum	6.1	6.1
Mean	7.1	6.9
No. Samples	105	46
% exceedance	0%	0%
Assessment	Full Support	Full Support
Water Temperature (ºC)		
Screening Level	≤ 35	≤ 35
Maximum	32.6	32.6
Minimum	8.9	10.2
Mean	22.7	22.3
No. Samples	17.0	29.0
% exceedance	0%	0%
Assessment	Full Support	Full Support
Chloride (mg/L)	*(Average value must not exceed Screening Level).*	
Screening Level	≤ 400	≤ 400
Mean	214	46
No. Samples	17	34
Supports Use	Yes	Yes
Sulfate (mg/L)	*(Average value must not exceed Screening Level).*	
Screening Level	≤ 100	≤ 100
Mean	52	36
No. Samples	18	7
Supports Use	Yes	Yes
Total Dissolved Solids (mg/L)	*(Average value must not exceed Screening Level).*	
Screening Level	≤ 1,100	≤ 1,100
Mean	-	298
No. Samples	No Data	46
Supports Use	-	Yes

Segment 0701 – Taylor Bayou above Tidal - Metals Data

Segment	***701***
Waterbody	Taylor Bayou @ LaBelle Rd.
On/Off Segment	On
Station_Id	10669

Aluminum (AWRL = 200 ppb)	
Chronic Screening Level	Not Applicable
Support (Y/N)	Not Applicable
Acute Screening Level	991
% exceeeds acute criteria	38%
No. Samples	8
Support (Y/N)	N

Arsenic (AWRL = 5 ppb)	
Chronic Screening Level	190
Support (Y/N)	Y
Acute Screening Level	360
% exceeeds acute criteria	0%
No. Samples	9
Support (Y/N)	Y

Cadmium (AWRL = 0.1ppb)	
Chronic Screening Level	0.81
Support (Y/N)	Y
Acute Screening Level	18.94
% exceeeds acute criteria	0%
No. Samples	8
Support (Y/N)	Y

Chromium (AWRL = 10 ppb)	
Chronic Screening Level	136
Support (Y/N)	Y
Acute Screening Level	1143
% exceeeds acute criteria	0%
No. Samples	9
Support (Y/N)	Y

Copper (AWRL =1.0 ppb)	
Chronic Screening Level	8.27
Support (Y/N)	Y
Acute Screening Level	11.86

% exceeeds acute criteria	0%
No. Samples	8
Support (Y/N)	Y

Segment	***701***
Waterbody	Taylor Bayou @ LaBelle Rd.
On/Off Segment	On
Station_Id	10669

Lead (AWRL = 0.1 ppb)	
Chronic Screening Level	1.66
Support (Y/N)	Y
Acute Screening Level	42.61
% exceeeds acute criteria	0%
No. Samples	8
Support (Y/N)	Y

Nickel (AWRL = 10 ppb)	
Chronic Screening Level	102
Support (Y/N)	Y
Acute Screening Level	921
% exceeeds acute criteria	0%
No. Samples	9
Support (Y/N)	Y

Selenium (AWRL = 2 ppb)	
Chronic Screening Level	5
Support (Y/N)	Y
Acute Screening Level	20
% exceeeds acute criteria	0%
No. Samples	9
Support (Y/N)	Y

Silver (AWRL = 0.5 ppb)	
Chronic Screening Level	NA
Support (Y/N)	NA
Acute Screening Level	0.92
% exceeeds acute criteria	0%
No. Samples	9
Support (Y/N)	Y

Zinc (AWRL = 5 ppb)	
Chronic Screening Level	68.75
Support (Y/N)	Y
Acute Screening Level	75.91
% exceeeds acute criteria	0%
No. Samples	8

Support (Y/N)	Y

Segment 0702 – Intracoastal Waterway Tidal
Conventional Parameters

Nutrient Impact

Segment	702	702	702	702	702
Waterbody / Station Description	Gulf Intracoastal Waterway (GIWW) @ SH 87	Taylor Bayou 1/4 mi. N of GIWW	Taylor Bayou @ Texaco dock	Alligator Bayou @ SH 82	Shallow Prong Lake on Big Hill Bayou
On/Off Segment	ON	ON	ON	OFF	OFF
Station_Id	10679	10640	10652	10643	10642
NO2+NO3-N (mg/L)					
Screening Level	≤ 0.26	≤ 0.26	≤ 0.26	≤ 1.83	≤ 0.26
Maximum	-	-	-	-	-
Minimum	-	-	-	-	-
Mean	-	-	-	-	-
No. Samples	No Data	No Data	No Data	No Data	No Data
% exceedance	-	-	-	-	-
Assessment	-	-	-	-	-
NH3-N (mg/L)					
Screening Level	≤ 0.10	≤ 0.10	≤ 0.10	≤ 0.58	≤ 0.10
Maximum	0.32	0.16	0.10	0.13	0.11
Minimum	0.03	0.03	0.03	0.03	0.03
Mean	0.06	0.07	0.05	0.06	0.04
No. Samples	22	22	16	8	13
% exceedance	9%	32%	0%	0%	8%
Assessment	No Concern	Concern	No Concern	No Concern	No Concern
Total PO4 (mg/L)					
Screening Level	≤ 0.22	≤ 0.22	≤ 0.22	≤ 0.71	≤ 0.22
Maximum	0.12	0.31	0.14	0.62	0.18
Minimum	0.05	0.10	0.03	0.14	0.03
Mean	0.08	0.16	0.09	0.325	0.08
No. Samples	22	22	19	8	13
% exceedance	0%	9%	0%	0%	0%
Assessment	No Concern	No Concern	No Concern	No Concern	No Concern
Chlorophyll α (µg/L)					
Screening Level	≤ 11.5	≤ 11.5	≤ 11.5	≤ 19.2	≤ 11.5
Maximum	12.6	30.2	7.1	111.0	12.8
Minimum	0.5	0.5	0.5	7.8	0.5
Mean	2.8	10.5	2.1	34.0	4.2
No. Samples	23	24	16	8	13
% exceedance	4%	29%	0%	88%	15%
Assessment	No Concern	Concern	No Concern	Concern	No Concern

Use Support Criteria

Segment	702	702	702	702	702
Waterbody / Station Description	Gulf Intracoastal Waterway (GIWW) @ SH 87	Taylor Bayou 1/4 mi. N of GIWW	Taylor Bayou @ Texaco dock	Alligator Bayou @ SH 82	Shallow Prong Lake on Big Hill Bayou
On/Off Segment	ON	ON	ON	OFF	OFF
Station_Id	10679	10640	10652	10643	10642
Dissolved Oxygen (mg/L)					
Screening Level	≥ 4	≥ 4	≥ 4	≥ 4	≥ 4
Maximum	9.6	14.4	10.7	14.2	9.2
Minimum	4.9	4.8	4.4	5.4	1.0
Mean	6.7	7.2	6.7	8.725	4.9
No. Samples	21	21	17	8	11
% exceedance	0%	0%	0%	0%	45%
Assessment	Full Support	Full Support	Full Support	Full Support	Not Supported
Fecal Coliform (#/100mL)					
Screening Level	≤ 400	≤ 400	≤ 400	≤ 400	≤ 400
Maximum	150	80	197	610	600
Minimum	3	3	3	10	3
Mean	28	27	32	281	99
No. Samples	22	22	16	8	12
% exceedance	0%	0%	0%	25%	17%
Assessment	Full Support	Full Support	Full Support	Full Support	Full Support

General Use Support Criteria

Segment	702	702	702	702	702
Waterbody / Station Description	Gulf Intracoastal Waterway (GIWW) @ SH 87	Taylor Bayou 1/4 mi. N of GIWW	Taylor Bayou @ Texaco dock	Alligator Bayou @ SH 82	Shallow Prong Lake on Big Hill Bayou
On/Off Segment	ON	ON	ON	OFF	OFF
Station_Id	10679	10640	10652	10643	10642
pH (std. units)					
Screening Level	6.0 - 9.0	6.0 - 9.0	6.0 - 9.0	6.0 - 9.0	6.0 - 9.0
Maximum	8.1	8.3	8.1	8.8	8.3
Minimum	6.5	6.6	6.3	7.0	5.9
Mean	7.5	7.5	7.5	7.9	6.9
No. Samples	272	127	205	29	16
% exceedance	0%	0%	0%	0%	6%
Assessment	Full Support	Full Support	Full Support	Full Support	Full Support
Water Temperature (ºC)					
Screening Level	≤ 35	≤ 35	≤ 35	≤ 35	≤ 35
Maximum	32.1	33.1	32.0	31.7	30.4
Minimum	11.7	13.5	11.8	14.5	9.9
Mean	23.5	24.2	23.3	25.8	20.3
No. Samples	22	22	17	8	13
% exceedance	0%	0%	0%	0%	0%
Assessment	Full Support	Full Support	Full Support	Full Support	Full Support
Chloride (mg/L)					
Screening Level	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Mean	-	-	-	-	-
No. Samples	-	-	-	-	-
Supports Use	-	-	-	-	-
Sulfate (mg/L)					
Screening Level	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Mean	-	-	-	-	-
No. Samples	-	-	-	-	-
Supports Use	-	-	-	-	-
Total Dissolved Solids (mg/L)					
Screening Level	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Mean	-	-	-	-	-
No. Samples	-	-	-	-	-
Supports Use	-	-	-	-	-

Segment 0702 – Intracoastal Waterway Tidal – Metals Data

Segment	***702***
Waterbody	Alligator Bayou @ SH 82
On/Off Segment	Off
Station_Id	10643

Aluminum (AWRL = 200 ppb)	
Chronic Screening Level	Not Applicable
Support (Y/N)	Not Applicable
Acute Screening Level	No Data
% exceeeds acute criteria	No Data
No. Samples	-
Support (Y/N)	-

Arsenic (AWRL = 5 ppb)	
Chronic Screening Level	190
Support (Y/N)	Y
Acute Screening Level	360
% exceeeds acute criteria	0%
No. Samples	8
Support (Y/N)	Y

Cadmium (AWRL = 0.1ppb)	
Chronic Screening Level	0.81
Support (Y/N)	Y
Acute Screening Level	18.94
% exceeeds acute criteria	0%
No. Samples	8
Support (Y/N)	Y

Chromium (AWRL = 10 ppb)	
Chronic Screening Level	136
Support (Y/N)	Y
Acute Screening Level	1143
% exceeeds acute criteria	0%
No. Samples	8
Support (Y/N)	Y

Copper (AWRL =1.0 ppb)	
Chronic Screening Level	8.27
Support (Y/N)	Y
Acute Screening Level	11.86
% exceeeds acute criteria	0%

No. Samples	8
Support (Y/N)	Y

Segment	***702***
Waterbody	Alligator Bayou @ SH 82
On/Off Segment	Off
Station_Id	10643

Lead (AWRL = 0.1 ppb)	
Chronic Screening Level	1.66
Support (Y/N)	Y
Acute Screening Level	42.61
% exceeeds acute criteria	0%
No. Samples	7
Support (Y/N)	Y

Nickel (AWRL = 10 ppb)	
Chronic Screening Level	102
Support (Y/N)	Y
Acute Screening Level	921
% exceeeds acute criteria	0%
No. Samples	8
Support (Y/N)	Y

Selenium (AWRL = 2 ppb)	
Chronic Screening Level	5
Support (Y/N)	Y
Acute Screening Level	20
% exceeeds acute criteria	0%
No. Samples	3
Support (Y/N)	Y

Silver (AWRL = 0.5 ppb)	
Chronic Screening Level	NA
Support (Y/N)	NA
Acute Screening Level	0.92
% exceeeds acute criteria	0%
No. Samples	8
Support (Y/N)	Y

Zinc (AWRL = 5 ppb)	
Chronic Screening Level	68.75
Support (Y/N)	Y
Acute Screening Level	75.91
% exceeeds acute criteria	0%
No. Samples	8

Support (Y/N)	Y

Segment 0703 – Sabine/Neches Canal Tidal
Conventional Parameters

Nutrient Impact

Segment	703
Waterbody / Station Description	Sabine/Neches Canal adjacent to TOPCo docks
On/Off Segment	ON
Station_Id	10683
NO2+NO3-N (mg/L)	
Screening Level	≤ 3.5
Maximum	-
Minimum	-
Mean	-
No. Samples	No Data
% exceedance	-
Assessment	-
NH3-N (mg/L)	
Screening Level	≤ 0.12
Maximum	0.16
Minimum	0.03
Mean	0.06
No. Samples	20
% exceedance	5%
Assessment	No Concern
Total PO4 (mg/L)	
Screening Level	≤ 0.23
Maximum	0.15
Minimum	0.03
Mean	0.08
No. Samples	20
% exceedance	0%
Assessment	No Concern
Chlorophyll α (µg/L)	
Screening Level	≤ 14.6
Maximum	10.4
Minimum	0.5
Mean	2.3
No. Samples	20
% exceedance	0%
Assessment	No Concern

Use Support Criteria

Segment	703
Waterbody / Station Description	Sabine/Neches Canal adjacent to TOPCo docks
On/Off Segment	ON
Station_Id	10683
Dissolved Oxygen (mg/L)	
Screening Level	≥ 4
Maximum	9.5
Minimum	3.0
Mean	6.5
No. Samples	20
% exceedance	5%
Assessment	Full Support
Fecal Coliform (#/100mL)	
Screening Level	≤ 400
Maximum	1030
Minimum	3
Mean	101
No. Samples	18
% exceedance	6%
Assessment	Full Support

General Use Support Criteria

Segment	703
Waterbody / Station Description	Sabine/Neches Canal adjacent to TOPCo docks
On/Off Segment	ON
Station_Id	10683
pH (std. units)	
Screening Level	6.0 - 9.0
Maximum	8.1
Minimum	6.1
Mean	7.3
No. Samples	276
% exceedance	0%
Assessment	Full Support
Water Temperature (ºC)	
Screening Level	≤ 35
Maximum	31.4
Minimum	11.6
Mean	22.9
No. Samples	20
% exceedance	0%
Assessment	Full Support
Chloride (mg/L)	*(Average value must not exceed Screening Level).*
Screening Level	Not Applicable
Mean	-
No. Samples	-
Supports Use	-
Sulfate (mg/L)	*(Average value must not exceed Screening Level).*
Screening Level	Not Applicable
Mean	-
No. Samples	-
Supports Use	-
Total Dissolved Solids (mg/L)	*(Average value must not exceed Screening Level).*
Screening Level	Not Applicable
Mean	-
No. Samples	-
Supports Use	-

Segment 0704 – Hillebrandt Bayou
Conventional Parameters

Nutrient Impact

Segment	704	704
Waterbody / Station Description	Hillebrandt Bayou @ Hillebrandt Rd.	Hillebrandt Bayou @ HumbleRd.
On/Off Segment	ON	ON
Station_Id	10685	10686
NO2+NO3-N (mg/L)		
Screening Level	≤ 3.5	≤ 3.5
Maximum	-	0.86
Minimum	-	0.01
Mean	-	0.31
No. Samples	No Data	35
% exceedance	-	0%
Assessment	-	No Concern
NH3-N (mg/L)		
Screening Level	≤ 0.17	≤ 0.17
Maximum	0.64	1.00
Minimum	0.03	0.01
Mean	0.17	0.34
No. Samples	17	35
% exceedance	29%	57%
Assessment	Concern	Concern
Total PO4 (mg/L)		
Screening Level	≤ 0.80	≤ 0.80
Maximum	0.51	1.60
Minimum	0.10	0.03
Mean	0.23	0.40
No. Samples	17	35
% exceedance	0%	9%
Assessment	No Concern	No Concern
Chlorophyll α (µg/L)		
Screening Level	≤ 11.6	≤ 11.6
Maximum	81.4	-
Minimum	0.5	-
Mean	20.5	-
No. Samples	17	No Data
% exceedance	65%	-
Assessment	Concern	-

Use Support Criteria

Segment	704	704
Waterbody / Station Description	Hillebrandt Bayou @ Hillebrandt Rd.	Hillebrandt Bayou @ HumbleRd.
On/Off Segment	ON	ON
Station_Id	10685	10686
Dissolved Oxygen (mg/L)		
Screening Level	≥ 4	≥ 4
Maximum	13.7	15.3
Minimum	3.2	1.0
Mean	7.5	7.5
No. Samples	17	35
% exceedance	12%	9%
Assessment	Partial Support	Full Support
Fecal Coliform (#/100mL)		
Screening Level	≤ 400	≤ 400
Maximum	1,150	18,100
Minimum	3	1
Mean	200	2653
No. Samples	17	36
% exceedance	18%	14%
Assessment	Full Support	Full Support

General Use Support Criteria

Segment	704	704
Waterbody / Station Description	Hillebrandt Bayou @ Hillebrandt Rd.	Hillebrandt Bayou @ HumbleRd.
On/Off Segment	ON	ON
Station_Id	10685	10686
pH (std. units)		
Screening Level	6.0 - 9.0	6.0 - 9.0
Maximum	9.0	8.7
Minimum	6.4	6.5
Mean	7.3	7.5
No. Samples	90	46
% exceedance	0%	0%
Assessment	Full Support	Full Support
Water Temperature (ºC)		
Screening Level	≤ 35	≤ 35
Maximum	33.4	33.5
Minimum	9.1	8.9
Mean	23.1	22.9
No. Samples	17	30
% exceedance	0%	0%
Assessment	Full Support	Full Support
Chloride (mg/L)	*(Average value must not exceed Screening Level).*	
Screening Level	≤ 250	≤ 250
Mean	164	144
No. Samples	17	35
Supports Use	YES	YES
Sulfate (mg/L)	*(Average value must not exceed Screening Level).*	
Screening Level	≤ 100	≤ 100
Mean	50	36
No. Samples	17	7
Supports Use	YES	YES
Total Dissolved Solids (mg/L)	*(Average value must not exceed Screening Level).*	
Screening Level	≤ 600	≤ 600
Mean	-	557
No. Samples	No Data	47
Supports Use	-	YES

Segment 0704 – Hillebrandt Bayou – Metals Data

Segment	***704***
Waterbody	Hillebrandt Bayou @ Humble Rd.
On/Off Segment	On
Station_Id	10686

Aluminum (AWRL = 200 ppb)	
Chronic Screening Level	Not Applicable
Support (Y/N)	Not Applicable
Acute Screening Level	991
% exceeeds acute criteria	0%
No. Samples	8
Support (Y/N)	Y

Arsenic (AWRL = 5 ppb)	
Chronic Screening Level	190
Support (Y/N)	Y
Acute Screening Level	360
% exceeeds acute criteria	0%
No. Samples	9
Support (Y/N)	Y

Cadmium (AWRL = 0.1ppb)	
Chronic Screening Level	0.81
Support (Y/N)	Y
Acute Screening Level	18.94
% exceeeds acute criteria	0%
No. Samples	8
Support (Y/N)	Y

Chromium (AWRL = 10 ppb)	
Chronic Screening Level	136
Support (Y/N)	Y
Acute Screening Level	1143
% exceeeds acute criteria	0%
No. Samples	9
Support (Y/N)	Y

Copper (AWRL =1.0 ppb)	
Chronic Screening Level	8.27
Support (Y/N)	Y
Acute Screening Level	11.86
% exceeeds acute criteria	0%

No. Samples	8
Support (Y/N)	Y

Segment	***704***
Waterbody	Hillebrandt Bayou @ Humble Rd.
On/Off Segment	On
Station_Id	10686

Lead (AWRL = 0.1 ppb)	
Chronic Screening Level	1.66
Support (Y/N)	Y
Acute Screening Level	42.61
% exceeeds acute criteria	0%
No. Samples	8
Support (Y/N)	Y

Nickel (AWRL = 10 ppb)	
Chronic Screening Level	102
Support (Y/N)	Y
Acute Screening Level	921
% exceeeds acute criteria	0%
No. Samples	9
Support (Y/N)	Y

Selenium (AWRL = 2 ppb)	
Chronic Screening Level	5
Support (Y/N)	Y
Acute Screening Level	20
% exceeeds acute criteria	0%
No. Samples	9
Support (Y/N)	Y

Silver (AWRL = 0.5 ppb)	
Chronic Screening Level	NA
Support (Y/N)	NA
Acute Screening Level	0.92
% exceeeds acute criteria	0%
No. Samples	9
Support (Y/N)	Y

Zinc (AWRL = 5 ppb)	
Chronic Screening Level	68.75
Support (Y/N)	Y
Acute Screening Level	75.91
% exceeeds acute criteria	0%
No. Samples	8

Support (Y/N)	Y

Segments 2411 & 2412 – Sabine Pass and Sabine Lake
Conventional Parameters

Nutrient Impact

Segment	2411	2412	2412
Waterbody / Station Description	Sabine Pass adjacent to US Coast Guard Station	Sabine Lake off Blue Buck Point	Sabine Lake near Stewts Island
On/Off Segment	ON	ON	ON
Station_Id	13298	13300	13302
NO2+NO3-N (mg/L)			
Screening Level	≤ 3.5	≤ 3.5	≤ 3.5
Maximum	-	-	-
Minimum	-	-	-
Mean	-	-	-
No. Samples	No Data	No Data	No Data
% exceedance	-	-	-
Assessment	-	-	-
NH3-N (mg/L)			
Screening Level	≤ 0.12	≤ 0.12	≤ 0.12
Maximum	0.32	0.20	0.31
Minimum	0.03	0.03	0.03
Mean	0.05	0.04	0.06
No. Samples	21	21	20
% exceedance	10%	5%	10%
Assessment	No Concern	No Concern	No Concern
Total PO4 (mg/L)			
Screening Level	≤ 0.23	≤ 0.23	≤ 0.23
Maximum	0.14	0.19	0.11
Minimum	0.03	0.01	0.03
Mean	0.08	0.07	0.07
No. Samples	21	21	20
% exceedance	0%	0%	0%
Assessment	No Concern	No Concern	No Concern
Chlorophyll α (µg/L)			
Screening Level	≤ 14.6	≤ 14.6	≤ 14.6
Maximum	12.5	7.1	7.7
Minimum	0.5	0.5	0.5
Mean	3.3	2.2	1.7
No. Samples	21	21	20
% exceedance	0%	0%	0%
Assessment	No Concern	No Concern	No Concern

Use Support Criteria

Segment	2411	2412	2412
Waterbody / Station Description	Sabine Pass adjacent to US Coast Guard Station	Sabine Lake off Blue Buck Point	Sabine Lake near Stewts Island
On/Off Segment	ON	ON	ON
Station_Id	13298	13300	13302
Dissolved Oxygen (mg/L)			
Screening Level	≥ 5	≥ 4	≥ 4
Maximum	10.0	10.1	9.6
Minimum	4.8	4.9	3.5
Mean	7.1	7.6	7.1
No. Samples	20	21.0	19.0
% exceedance	5%	0%	5%
Assessment	Full Support	Full Support	Full Support
Fecal Coliform (#/100mL)			
Screening Level	≤ 400	≤ 400	≤ 400
Maximum	87	100	230
Minimum	3	3	3
Mean	14	17	41
No. Samples	21	21	18
% exceedance	0%	0%	0%
Assessment	Full Support	Full Support	Full Support

General Use Support Criteria

Segment	2411	2412	2412
Waterbody / Station Description	Sabine Pass adjacent to US Coast Guard Station	Sabine Lake off Blue Buck Point	Sabine Lake near Stewts Island
On/Off Segment	ON	ON	ON
Station_Id	13298	13300	13302
pH (std. units)			
Screening Level	6.0 - 9.0	6.0 - 9.0	6.0 - 9.0
Maximum	8.2	8.0	7.9
Minimum	6.8	6.8	5.6
Mean	7.7	7.5	7.2
No. Samples	300	71	65
% exceedance	0%	0%	3%
Assessment	Full Support	Full Support	Full Support
Water Temperature (ºC)			
Screening Level	≤ 35	≤ 35	≤ 35
Maximum	31.7	32.7	30.2
Minimum	12.5	12.5	10.3
Mean	23.0	22.9	22.6
No. Samples	21	22	20
% exceedance	0%	0%	0%
Assessment	Full Support	Full Support	Full Support
Chloride (mg/L)	*(Average value must not exceed Screening Level).*		
Screening Level	Not Applicable	Not Applicable	Not Applicable
Mean	-	-	-
No. Samples	-	-	-
Supports Use	-	-	-
Sulfate (mg/L)	*(Average value must not exceed Screening Level).*		
Screening Level	Not Applicable	Not Applicable	Not Applicable
Mean	-	-	-
No. Samples	-	-	-
Supports Use	-	-	-
Total Dissolved Solids (mg/L)	*(Average value must not exceed Screening Level).*		
Screening Level	Not Applicable	Not Applicable	Not Applicable
Mean	-	-	-
No. Samples	-	-	-
Supports Use	-	-	-

Appendix E

Glossary

Ambient Water Reporting Limit (AWRL) - Reporting specifications at or below which data for a parameter must be reported to be compared with screening criteria.

Ammonia-Nitrogen (NH3) – a colorless gas compound that is very soluble in water, and has a pungent odor. Formed as a result of the decomposition of most nitrogenous organic material. Also used as a fertilizer. Elevated concentrations are indicative to pollution.

Bacteria – Microorganisms that can cause infections or diseases in plants and animals. Bacteria form the base of food webs by transforming inorganic materials into complex compounds, and breaking complex compounds into inorganic materials. By shifting matter back and forth between simple and complex forms, bacteria make food available for other organisms.

Chloride – Chloride is the negatively charged chlorine ion present in water. Chlorides in reasonable concentrations are not harmful to humans. At concentrations above 250 mg/L they impart a salty taste to water. External sources of chloride include septic systems, animal wastes, oil field brines, and potassium chloride fertilizer.

Chlorophyll – Chlorophyll is the green pigment present in all plant life necessary for photosynthesis. The amount present in a water body is proportional to the amount of algae in the water. Chlorophyll is commonly used as an indicator of water quality.

Criteria – Water quality conditions, which are to be met in order to support and protect desired uses.

Dissolved Oxygen (DO) – The amount of oxygen dissolved in water. DO is supplied to a water body through diffusion of atmospheric oxygen in the water and the photosynthetic production of oxygen by algae and aquatic plants. Respiratory processes, oxidation of inorganic waste, and the decomposition of organic matter decrease oxygen concentrations in water.

E. coli (Escherichia coli) – A bacterium common to the human intestinal tract.

Fecal coliform bacteria – Indicator microorganism that typically inhabits the intestinal tracts of animals such as cattle, pigs, waterfowl, deer, and humans. Fecal coliform is generally assumed to be an indicator of septic tank contamination.

Freshwater – Inland waters which exhibit no measurable elevation changes due to normal tides.

Nitrogen – The five major forms of nitrogen in freshwater are elemental nitrogen (N2), organic nitrogen, ammonia (NH3), nitrate (NO3), and nitrite (NO2). NH3, NO3, and NO2 are readily available to aquatic plants and algae for metabolic uptake.

Nitrate-Nitrogen (NO3-N) – This nitrogen compound is readily utilized by algae and aquatic plants; however, it must be reduced before it can be metabolically used. Therefore, most algae and aquatic plants prefer ammonia to nitrate.

Nitrite-Nitrogen (NO2-N) – Is typically present in surface waters in low concentrations. High concentrations may be indicative of septic system or sewage treatment plant inputs.

Nutrients – Any material that organisms take in and assimilate for growth and maintenance. In water, nutrients can act as fertilizing compounds and stimulate and sustain growth and development of aquatic plants and algae. Nitrogen and phosphorus compounds are the two most important nutrients.

Segment – A water body or portion of a water body, which is individually defined and classified in the Texas Surface Water Quality Standards. A segment is intended to have relatively homogenous chemical, physical, and hydrological characteristics. A segment provides the basic unit for assigning site-specific standards and for applying water quality management programs.

Texas Surface Water Quality Standards (TSWQS) – Defines river basin classification categories, describes justifications for standards and modifications to maintain the quality of water in the state consistent with public health and enjoyment, propagation and protection of terrestrial and aquatic life, operation of existing industries, and economic development of the state.

Tidal – Descriptive of coastal waters which are subject to the ebb and flow of tides. Classified tidal waters include all bays and estuaries with a segment number 24xx, all streams with the word tidal in the segment name, and the Gulf of Mexico.

Total Maximum Daily Load (TMDL) – The total amount of a substance that a water body can assimilate and still meet the Texas Surface Water Quality Standards.

Total Phosphorus – Is the sum of all phosphorus forms, including dissolved, and particulate organic phosphates from algae and other organisms, inorganic particulate phosphorus.

Watershed – Area that carries surface runoff directly or indirectly, through streams and river, to the oceans.